

SUPPLEMENT.

The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

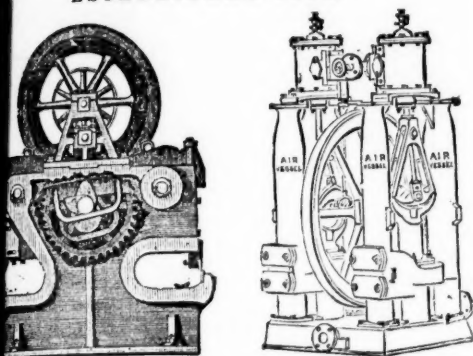
[The MINING JOURNAL is Registered at the General Post Office as a Newspaper, and for Transmission Abroad.]

2178.—VOL. XLVII.

LONDON, SATURDAY, MAY 19, 1877.

PRICE (WITH THE JOURNAL) SIXPENCE.
PER ANNUM, BY POST, £1 4s.

JOHN CAMERON'S
SPECIALITIES ARE ALL SIZES OF
Pumps, Shipbuilders' Tools,
BAR SHEARS.
ESTABLISHED 1852.



FIELD ROAD IRON WORKS,
SALFORD, MANCHESTER.

Excellence
Practical Success
of Engines



Represented by
Model exhibited by
this Firm.

HARVEY AND CO.
ENGINEERS AND GENERAL MERCHANTS,
HAILE, CORNWALL.

LONDON OFFICE,—186, GRESHAM HOUSE, E.C.

MANUFACTURERS OF
PUMPING and other LAND ENGINES and MARINE STEAM ENGINES
the largest and most approved kinds in use, SUGAR MACHINERY,
MILLWORK, MINING MACHINERY, AND MACHINERY IN GE-
NERAL. SHIPBUILDERS IN WOOD AND IRON.

MANUFACTURERS OF
STANDARD'S PATENT PNEUMATIC STAMPS.

SECONDHAND MINING MACHINERY FOR SALE.

In Good Condition, at MODERATE PRICES—viz.,

WINDING ENGINES; WINDING ENGINES; STAMPING ENGINES;
TEAM CAPSTANS; ORE CRUSHERS; BOILERS and PITWORK of
various sizes and descriptions; and all kinds of MATERIALS required for
MINING PURPOSES.

LYON & DAVISON,
FOUNDERS, ENGINEERS, & CO.,
Haydon Bridge, near NEWCASTLE-ON-TYNE,

Manufacturers of
SMELTING, REDUCING, AND REFINING FURNACES,
SLAG HEARTHS, AND SMELTERS' WORK GEAR.

Plans and Estimates furnished for Improved Lead or Copper Mining and
Smelting Plant.

LAWRENCE ROPE WORKS,

NEWCASTLE-ON-TYNE. Established 1782.

THOMAS AND WILLIAM SMITH,

Manufacturers of all kinds of Iron, Steel, Copper, and Galvanised Wire Ropes;
and Manila Ropes, &c.; Round and Flat Shaft Ropes; Crab Ropes; Guide
Ropes; Hauling Ropes; and Galvanised Signal Strand; Ship's Standing Rigging
complete; Patent Hemp and Manila Hawseers, Warps, Cords, Span-yarn,
&c.; Manila Yarn for Telegraph Cables, and Flat Hemp Ropes for Driving
Machinery; and all kinds of Rope and Cable.

QUEEN STREET, NEWCASTLE-ON-TYNE; DOCK YARD, NORTH
SHIELDS; 17, PHILPOT LANE, LONDON, E.C.

Stores—North Shields, Blackwall, Newcastle, and Tyne Dock.

STANDARD LUBRICATING OILS
COMPANY, LIMITED.

MARK and PALE OILS for MACHINERY, RAILWAY, and MINING
PURPOSES, from TWO SHILLINGS per gallon, and upwards.

AGENTS WANTED.

95, CANNON STREET, LONDON, E.C.

BENNETTS' SAFETY FUSE WORKS,

ROSKEAR, CAMBORNE, CORNWALL.

SAFETY FUSE FOR MINING AND ENGINEERING

PURPOSES.

Adapted for wet or dry ground, and effective in Tropical or Polar Climates.

BENNETTS, having had many years experience as chief engineer with
Messrs. Bickford, Smith, and Co., is now enabled to offer Fuse of every variety of
manufacture, of best quality, and at moderate prices.

Price Lists and Sample Cards may be had on application at the above address.

LONDON OFFICE,—H. HUGHES, Esq., 85, GRACECHURCH STREET.



PARIS,
BRONZE MEDAL, 1867.



ORDER OF THE CROWN OF PRUSSIA.



FALMOUTH,
SILVER MEDAL, 1867.

A DIPLOMA—HIGHEST OF ALL AWARDS—given by the
Geographical Congress, Paris, 1875—M. Favre, Contractor, having
exhibited the McKean Drill alone as the MODEL BORING MACHINE
for the ST. GOTHARD TUNNEL.

SILVER MEDAL of the Highland and West of Scotland
Agricultural Society, 1875—HIGHEST AWARD.

At the south end of the St. Gothard Tunnel, where

THE MCKEAN ROCK DRILLS

Are exclusively used, the advance made during eight consecu-
tive weeks, ending February 7, was 24'90, 27'60, 24'80, 26'10,
28'30, 27'10, 28'40, 28'70 metres. Total advance of south head-
ing during January was 121'30 metres, or 133 yards.

In a series of comparative trials made at the St. Gothard Tun-
nel, the McKean Rock Drill continued to work until the pres-
sure was reduced to one-half atmosphere (7½ lbs.), showing
almost the entire motive force to be available for the blow
against the rock—a result of itself indicating many advantages.

The GREAT WESTERN RAILWAY has adopted these
Machines for the SEVERN TUNNEL; the LONDON AND
NORTH-WESTERN RAILWAY for the FESTINIOG TUN-
NEL; and the BRITISH GOVERNMENT for several Public
Works. A considerable number of Mining Companies are now
using them. Shafts and Galleries are driven at from three to
six times the speed of hand labour, according to the size and
number of machines employed, and with important saving in
cost. The ratio of advantage over hand labour is greatest
where the rock is hardest.

These Machines possess many advantages, which give them
a value unapproached by any other system of Boring Machine.

THE MCKEAN ROCK DRILL IS ATTAINING GENERAL
USE THROUGHOUT THE WORLD FOR MINING, TUN-
NELLING, QUARRYING, AND SUB-MARINE BORING.

The MCKEAN ROCK DRILLS are the most powerful—the
most portable—the most durable—the most compact—of the
best mechanical devices. They contain the fewest parts—have
no weak parts—act without SHOCK upon any of the operat-
ing parts—work with a lower pressure than any other Rock
Drill—may be worked at a higher pressure than any other
—may be run with safety to FIFTEEN HUNDRED STROKES
PER MINUTE—do not require a mechanic to work them—are
the smallest, shortest, and lightest of all machines—will give
the longest feed without change of tool—work with long or
short stroke at pleasure of operator.

The SAME Machine may be used for sinking, drifting, or
open work. Their working parts are best protected against
grit and accidents. The various methods of mounting them
are the most efficient.

N.B.—Correspondents should state particulars as to
character of work in hand in writing us for information,
on receipt of which a special definite answer, with
reference to our full illustrated catalogue, will be sent.

PORTABLE BOILERS, AIR COMPRESSORS, BORING STEEL,
IRON, AND FLEXIBLE TUBING.

The McKean Drill may be seen in operation daily in London.

McKEAN AND CO.

ENGINEERS.

OFFICES,

42 BOROUGH ROAD, LONDON, S.E.; and
5, RUE SCRIBE, PARIS.

MANUFACTURED FOR MCKEAN AND CO. BY

MESSERS. P. AND W. MACLELLAN, "CLUTHA IRONWORKS,"
GLASGOW.

The Warsop Rock Drill

(Involving an entirely new principle in Mechanical Boring)

Requires only 20 lbs. steam or air-pressure.
Has only two moving parts—thus ensuring freedom from de-
rangement, and is absolutely self-feeding.
Is excessively light, and can be carried by one man, who can
with the No. 1 size (weighing only 35 lbs.) drill 40 holes
½ in. diameter and 1½ in. deep per minute, in the hardest Aber-
deen granite for splitting purposes.

WARSOP AND HILL,

HYDRAULIC AND GENERAL ENGINEERS.

NOTTINGHAM.

STEAM and HYDRAULIC WINDING and PUMPING ENGINES
of all kinds.

DUNN'S ROCK DRILL,

AND

AIR COMPRESSORS.

DRIVING BED ROCK

TUNNELS, SINKING

SHAFTS, AND PERFORMING

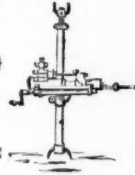
OPEN FIELD OPERATIONS,

IS THE

CHEAPEST, SIMPLEST,

STRONGEST, & MOST EFFECTIVE

DRILL IN THE WORLD.



OFFICE,—193, GOSWELL ROAD

(W. W. DUNN AND CO.),

LONDON, E.C.

THE

PATENT SELF-ACTING MINERAL DRESSING MACHINE COMPANY

(LIMITED).

T. CURRIE GREGORY, C.E., F.G.S.

OFFICES.—GLASGOW: 150, ST. VINCENT STREET.

LONDON: 85, GRACECHURCH STREET, E.C.

IMPORTANT NOTICE TO MINE PROPRIETORS.

MR. GEORGE GREEN, ENGINEER, ABERYSTWTH.

SUPPLIES MACHINES under the above Company's Patents for
DRESSING all METALLIC ORES. Dressing-floors having these Machines pre-
pare the following advantages:—

- 1.—THEY ARE CHEAPER THAN ANY OTHER KIND IN FIRST OUTLAY.
- 2.—ONLY ABOUT ONE-FOURTH OF THE SPACE USUALLY OCCUPIED
BY DRESSING-FLOORS IS REQUIRED.
- 3.—FROM 60 TO 70 PER CENT. OF THE LABOUR IN DRESSING, AND
FROM 5 TO 10 PER CENT. OF ORE OTHERWISE LOST, IS SAVED.
- 4.—THEY ARE THE ONLY MACHINES THAT MAKE THE ORE CLEAN
FOR MARKET AT ONE OPERATION.

They have been supplied to some of the principal mines in the United Kingdom
and abroad—viz.,

The Greenside Mines, Patterdale, Cumberland; London Lead Company's Mines,
Darlington, Colberry, Nanthead, and Bollyhope; the Stonecroft and Greyside
Mines, Hexham, Northumberland; Wanlockhead Mines, Abington, Scotland (the
Duke of Buccleuch's); Bewick Partners, Haydon Bridge; the Old Darren, Es-
gairmyn, and Ystuntnen Mines, in Cardiganshire; Mr. Beaumont's W.B. Mines,
Darlington; also Mr. Scoway, for Argoniferous Copper Mines, Peru; the Brat-
berg Copper Mines, Norway, and Mines in Italy, Germany, United States of
America, and Australia, from all of whom certificates of the complete efficiency of
the system can be had.

WASTE HEAPS, consisting of refuse chaps and skimpings of a
former washing, containing a mixture of lead, blende, and sulphur,
DRESSED TO A PROFIT.

MR. BAINBRIDGE, C.E., of the London Company's Mines, Middleton-
in-Teesdale, by Darlington, writing on the 20th March, 1876, says—"The yearly
profit on our Nanthead waste heaps amounted last year to £800, besides the ma-
chinery being occupied for some months in dressing waste ore from the mines. Of
course, if it had been wholly engaged in dressing wastes our returns would have
been greater; but it is giving us every satisfaction, and bringing the waste heaps
into profitable use, which would otherwise remain dormant."

MR. T. B. STEWART, Manager of the Duke of Buccleuch's Mines,
Wanlockhead, Abington, N.B., writing on 20th March, 1876, says—"I have much
pleasure in stating that a full and superior set of your Ore Dressing Machinery has
been at work at these mines for fully a month, and each day as the moving parts
become smoother, and those in charge understand the working of the machinery
better, it gives increasing satisfaction, the ore being dressed more quickly, cheaply,
and satisfactorily than by any other method."

MR. BAINBRIDGE, speaking of machinery supplied Colberry Mines,
says—"Your machinery saves fully one-half on old wages, and vastly more on the
wages we have now to pay. Over and above the saving in cost is the saving in ore,
which is a great deal more than 10 per cent."

GREENSIDE MINE COMPANY, Patterdale, near Penrith, say—"The
separation which they make is complete."

MR. MONTAGUE BEALE says—"It will separate ore, however close
the mechanical mixture, in such a way as no other machines can do."

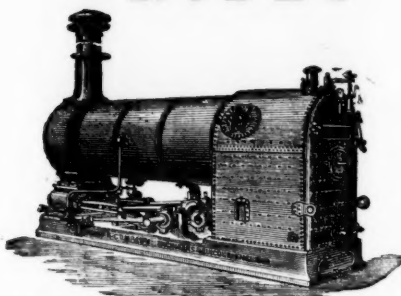
MR. C. DODSWORTH says—"It is the very best for the purpose
and will do for any kind of metallic ores—the very thing so long needed for dress-
ing floors."

Drawings, specifications, and estimates will be forwarded on application to—

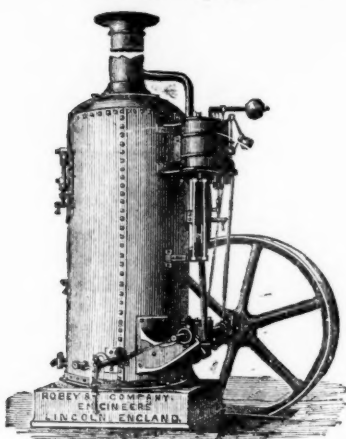
GEORGE GREEN, M.E., ABERYSTWTH SOUTH WALES.

ROBEY & CO., ENGINEERS, LINCOLN,

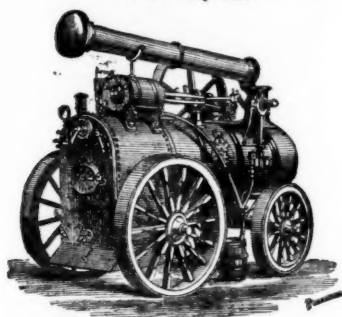
SOLE MANUFACTURERS OF THE



THE PATENT ROBEY FIXED ENGINE AND LOCOMOTIVE BOILER COMBINED, 4 to 50-horse power.

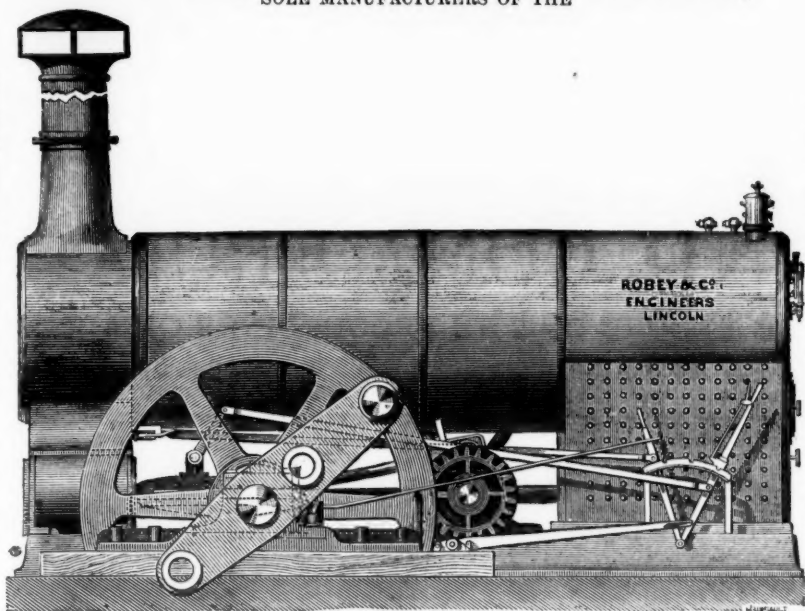


VERTICAL STATIONARY STEAM ENGINE AND PATENT BOILER COMBINED, 2 to 12 horse power.

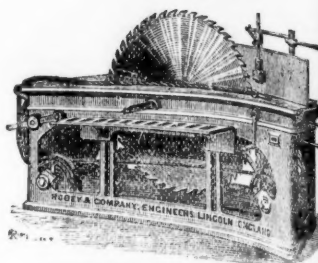


SUPERIOR PORTABLE ENGINES, 4 to 50-horse power.

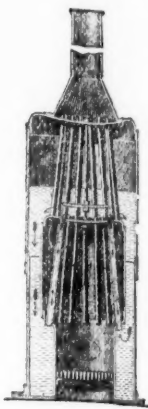
No Expensive Brick Buildings or High Chimney required.



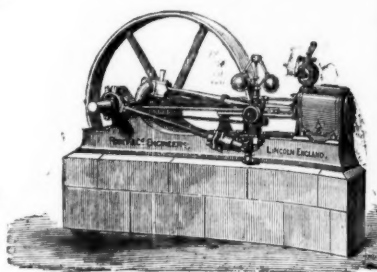
Boiler can be supplied with special Fire-box for Burning Wood, Sawdust, Turf, and every description of inferior Fuel.



SELF-ACTING CIRCULAR SAW BENCH.



PATENT VERTICAL BOILERS, 2 to 12 horse power.



IMPROVED HORIZONTAL FIXED STEAM ENGINE, 4 to 60-horse power.

PATENT IMPROVED ROBEY MINING ENGINE, OF ALL SIZES, FROM 4 TO 50-HORSE POWER.

Some of the advantages of this New Engine are as follows:—
SMALL FIRST COST. SAVING OF TIME AND EXPENSE IN ERECTING. EASE, SAFETY, AND ECONOMY IN WORKING. GREAT SAVING IN FUEL.
This New Engine is free from all the objections that can be urged against using the Semi-Portable Engine for permanent work, because it possesses the rigidity and durability of the Horizontal Engine, and at the same time retains the advantages of the Semi-Portable in saving time and expense in fixing.

THE PATENT ROBEY FIXED ENGINE

(Also above illustrated) is admirably adapted for driving Rolling Mills, Saw Mills, Brick Machinery, Pumping Machinery, and all descriptions of Fixed Machinery.

ENGINES UP TO 200 EFFECTIVE HORSE-POWER ALWAYS IN PROGRESS.

Prices and full particulars of all the Machinery here illustrated on application to the Sole Manufacturers,

ROBEY & CO., ENGINEERS, LINCOLN, ENGLAND.
London Office: 117, Cannon Street, London, E.C.

COLEBROOK'S PATENT STEAM PUMPS, FOR BOILER FEEDING AND HIGH LIFTS.

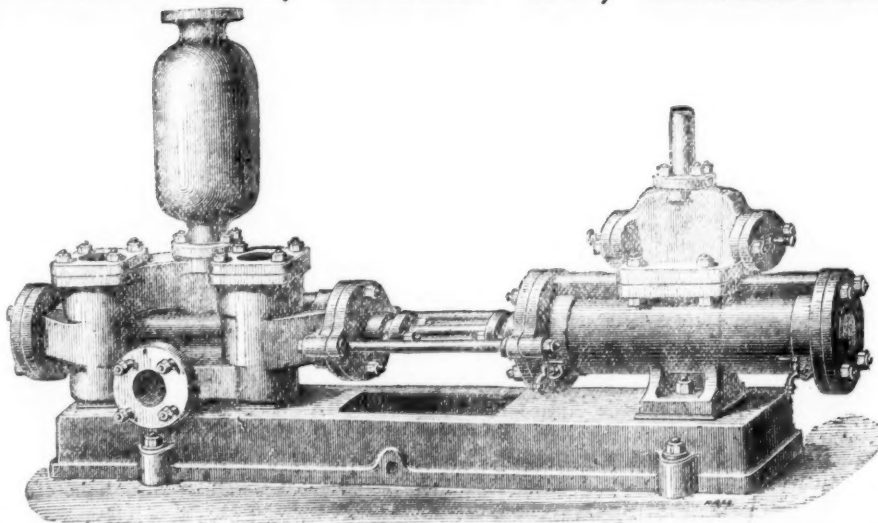
SOLE MAKERS,—

MAY AND MOUNTAIN, BERKLEY ST., BROAD ST., BIRMINGHAM.

The accompanying Engraving represents a Steam Pump, suitable for boiler feeding and high lifts; it possesses the following advantages over any other Steam Pump yet before the public:—

1st.—No tappets, eccentrics, levers, or other mechanical appliances are used to actuate the steam slide valve, but this office is performed by the exhaust steam.

2nd.—The only working parts in the steam cylinder are the piston and slide valve, and as there are no working parts in either the piston or cylinder covers, the full length of stroke is obtained.



3rd.—The slide valve is so easy of access that it can be examined, cleaned, and replaced in a few minutes, and it is impossible to make any error in replacing it after examination, because it is immaterial which way it is inserted in the valve-box, whether one way or the other upwards, or whether end for end.

The pump valves and seats are of gun metal, and can be easily examined, cleaned, and replaced or renewed in a very short time by any ordinary workman.

SIZES AND PRICES OF COLEBROOK'S PATENT STEAM PUMPS.

| | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|------|------|------|
| Diameter of Steam Cylinder.....Inches | 1½ | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 8 |
| Diameter of Pump Cylinder.....Inches | 1 | 1½ | 2 | 2½ | 3 | 2 | 2½ | 3 | 4 | 3 | 4 | 5 | 3 | 4 | 5 | 6 | 3 | 4 | 5 | 6 | 7 |
| Length of Stroke.....Inches | 6 | 12 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| Price | £12 | £16 | £17 | £18 | £19 | £19 | £20 | £22 | £25 | £23 | £28 | £32 | £26 | £33 | £36 | £41 | £30 | £38 | £41 | £45 | £52 |
| Diameter of Steam Cylinder.....Inches | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 9 | 9 | 10 | 10 | 10 | 10 | 10 | 10 | 12 | 12 | 12 | 12 | 12 | 12 |
| Diameter of Pump Cylinder.....Inches | 5 | 6 | 7 | 8 | 5 | 6 | 7 | 8 | 9 | 5 | 6 | 7 | 8 | 9 | 10 | 6 | 7 | 8 | 9 | 10 | 12 |
| Length of Stroke.....Inches | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| Price | £45 | £50 | £56 | £65 | £50 | £55 | £60 | £70 | £81 | £62 | £68 | £70 | £80 | £95 | £100 | £80 | £85 | £90 | £100 | £115 | £135 |

Many other combinations of steam and water cylinders in both classes of pump can be made, for which prices can be obtained on application. The water cylinders can be supplied with brass or gun metal linings at an increased cost, according to size. Any of the above pumps can be arranged to act as stationary fire-engines.

Original Correspondence.

PUMPING ENGINES:

THE DIFFERENTIAL AND IMPROVED HYDRAULIC.

The Midland Institute of Mining Engineers, in the Transactions just issued to the members as the result of the last meeting, gives an interesting paper by Mr. HENRY DAVEY, of the Sun Foundry, Leeds, on "The Differential and Improved Hydraulic Pumping Engines," which was read at the joint meeting of the North of England Mining and Mechanical Engineers. As to the theory of the engine, the paper states that as economy of fuel is the most important question connected with pumping machinery, it would be well to examine and see if the differential possessed the elements required to constitute it an economical engine, and in order to do that it would be necessary to determine in what steam-engine economy would be necessary to estimate the efficiency of the engine in terms of pounds of fuel burnt per indicated horse-power was like many of the practical rules used by engineers, fallacious. The only scientific, and consequently the only true, method was to estimate the efficiency in terms of pounds of steam passing through the engine per indicated horse-power developed. The leading principle of economy was expansion, and the engine which would work with the greatest amount of expansion, *ceteris paribus*, was the most economical. There were, however, certain conditions necessary to expansive working. The resistance to be overcome in pumping was almost constant, and the force applied to overcome that resistance by the expansion of steam varied. It followed then—1. That to expand to a great extent in a single cylinder a great strain must be put on the engine above that necessary to overcome the resistance of working the pumps.—2. That a great moving mass must be provided, and a great maximum piston speed employed to render expansive working in a high degree practicable in a single cylinder. In practice the first of these corollaries is illustrated in the great number of accidents that have taken place with Cornish engines working with a high degree of expansion, so that in consequence expansion had of late years been very much reduced, causing a large falling off in duty. The second was illustrated by the fact that it had not been found practicable to work Cornish engines expansively with a moderate piston speed, such as was necessary in lifting water. The only condition under which the Cornish engine had proved itself an economical machine was that of actuating plunger lifts where a great mass of matter had been lifted at a great speed, and caused to fall slowly in lifting the water in the pumps. These were two of the most serious difficulties surmounted by the compound differential engine. In a compound engine expanding 10 times, the variation in force between the commencement and end of the stroke was as $2\frac{1}{2}$ to 1, but in the single cylinder, with the same degree of expansion it would be 10 to 1—that was to say, the variation in the two pressures was four times as great in the case of the Cornish engine as that of the compound engine. As that variation had to be compensated by *vis viva*, or by weight and velocity, it was evident that with the smaller variations less weight and less speed were required. It was claimed for the compound differential engine as advantages over the Cornish engine—1. The first cost of the engine and buildings taken together was 50 per cent. less than that of the Cornish engine.—2. It gave a higher duty under similar conditions of working.—3. It required less costly pitwork.—4. It gave a higher duty and worked with a higher degree of expansion under conditions of working which would not admit of any appreciable amount of expansion in the Cornish engine.—5. It saved the pump work from the heavy shocks and breakages arising from the pump taking air.—6. It was a simpler machine, had fewer parts, every detail being on one floor line, and more readily accessible.

With respect to Mr. Davey's hydraulic pumping-engines it was stated that there were many situations in which a small quantity of water supplied under a considerable pressure could be profitably employed to pump a greater quantity of water against a less pressure. In "dip" workings in collieries, for instance, engines worked in that way could be advantageously used to raise water to the main pumping-engines, the motive water in such case being supplied from the rising main of the main engine. In hilly mining districts water down from a high level might be conducted by pipes into the mines, and then used to raise a greater quantity of water to the surface, and so avoiding the necessity for steam power. The engine to which preference has been made was designed to obviate the difficulty of wear and tear experienced with hydraulic engines having pistons and slide valves, and gearing for working the valves; pistons and slide valves wear very rapidly with dirty water, whilst plungers were practically unaffected. In the engine in question there were no pistons, but the power was applied and the work done entirely with plungers. The power plungers were stationary, and were made to serve as pipes to convey the water from the valve-box (to which they were fixed) to the inside of the pump plungers, the latter forming the power cylinders, being connected to each other by side rods passing outside the valve-box. In that way the forcing stroke of one pump plunger caused the suction of the other, and *vice versa*. The novel part of the engine was the valve-box. For hydraulic power no valves answered better than the single mitre valves, for if the valves got leaky because of sand and grit they were easily replaced by duplicates, or ground tight again. The difficulty with single mitre valves of the ordinary type was, however, that of working them when made of sufficient size to produce but little throttling. That difficulty was entirely obviated by the engine under notice, for the valves instead of being actuated by means of metallic connections were worked under water pressure by means of a small subsidiary valve acted on by tappets from the engine at the end of the stroke. On this construction the valves could be made of any size, and a full and free water way given so as to realise the greatest possible useful effect. By regulating the passages between the subsidiary and main valves the latter were made to rise and fall at any required speed, so that the heat might be entirely taken off, and the wear and tear of the valves reduced to a minimum. When the pumping-engine could be placed near the water level, without risk of the water rising during a temporary stoppage as to drown the engine, that was certainly the best plan on every consideration, and effected a very large saving in the cost of maintenance. If the engine could not be placed within suction reach of the water without danger it could be placed at some short distance (say, 50 feet up the pit), and the water lifted to it by means of a common lift or quadrant, or by a hydraulic engine.

THE HYDRAULIC SINKING ENGINE.—For draining pits during sinking operations Mr. Davey proposes to employ hydraulic pressure. Instead of using wooden spears inside the pump to transmit the power of the engine, he proposes to employ what may be termed a water spear in a pipe on the outside of the pump, and to attach the working part of the pump to a capstan-engine by means of a wire rope, in such a manner that the rope remains attached whilst the pump is at work, so that should the bucket or clack require removal for re-gearing it would only be necessary to throw the capstan into gear and hoist the working parts to the surface. A duplicate bucket and clack should be kept ready to be lowered into place immediately the defective ones were brought to the surface. This would obviate the difficulties and delays occasioned in changing buckets and clacks through door pieces and in drawing spears—a recourse which has often to be resorted to, especially in heavily watered pits. The *modus operandi* of the system was—a forcing-engine was employed to pump water into the pressure pipe, to which an accumulator is attached for the purpose of maintaining a constant force. A valve-box is placed at the top of the pit, from which the pressure from the accumulator was alternately applied and released from the pressure-pipe, causing the plunger and bucket to ascend and descend in the working barrel. The motion thus imparted to the bucket produced the same pumping action as was produced in the ordinary way—water being drawn in through the clack and delivered above the bucket during the upward stroke, whilst the bucket was placed in equilibrium, so far as water pressure was concerned, and fell by its own gravity during the downward stroke. The wire rope would be counterbalanced over the pit head frame, and reciprocated with

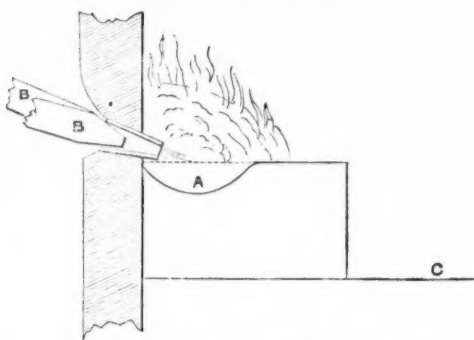
the motion of the bucket, and in its turn would actuate the valves through the medium of tappets and a small valve, similar to that described in connection with the horizontal hydraulic engines. As the sinking continued the pump and pipes, which would be slung in wire ropes or ground spears in the usual way, would be lowered till the telescopic pipe was extended to its full length and the delivery launder was on a level with the ground. Then other pipes would be added, and the sinking continued as before, the whole of the operations being performed from the surface.

MINING IN THE EAST—No. XIII.

ROSETTING—REFINING.

Formerly all the copper was sold as rosette copper; but, owing to the expense of this method of refining, and to the loss *en route* occasioned by small pieces chipping off, this method was abandoned in 1872, and the copper made into black copper, so called from the oxidised crust which is formed externally on exposure to the air while hot. In Hungary the impure copper was either roughly refined in the Hungarian furnace—*spleisssofen*, and worked up in the hammer-works as *spleisskupper*, or more carefully refined in the rosetting hearth, from which a good commercial copper was obtained; generally it contained suboxide. The Hungarian furnace is preferred, as costing much less; rosette copper is, however, worth 4*l.* per ton more.

ROSETTING HEARTH.



A.—Crucet. B.—Blast-pipes. C.—Floor.

The above vertical section, drawn at a scale of 4 ft. to 1 in., will show the arrangement.

This hearth is first heated with charcoal, and the discs of crude copper laid one on the other to the amount of 8 or 10 cwt., when the charcoal is raked back over it, and the blast turned on. The discs melt into the crucet, and the blast of the two pipes play over the surface, thus oxidising the base metals contained. The refiner examines the state of the copper by removing a sample from the surface of the bath through the tuyere. When slightly over-refined the charcoal fire is scraped away, and the hearth cleaned.

Water is scattered over the copper bath, and a thin disc removed, and this operation continues until the whole of the copper disappears from the crucet. The discs are then packed into bundles of 2 cwt. each, bound with iron wire, and are ready for sale. The time required for refining is from five to six hours, and the crucet requires renewing at the end of seven operations. A small loss of copper takes place, owing to sublimation, which colours the flames with brilliant green shades.

DIVERS OPERATIONS.—The "bears" of copper, resulting from carelessness or accident, are reheated in a furnace specially constructed, and broken up into manageable fragments; they are then passed through the copper furnace towards the end of a campaign with some mattes rich in sulphur. The expense of breaking them up is about 2*s.* per ton, and it costs 30*s.* per ton to smelt into ingots. The furnace "bottoms" after removal are carefully examined, and any adhering copper or mattes broken off. There is some copper lost in these "bottoms," but it is not sufficient to pay for the labour of extracting it. The furnace "bottoms" from the first operations contain 3 to 4 cent. of copper.

COST OF COPPER MAKING.

The total expenditure for the production of 1 ton of copper during 1875 was, on account of adverse circumstances, much heavier than in any previous or subsequent year. The principal reason was, of course, the exceptionally low percentage of the ores reduced. Owing to the total destruction by fire of the Bakarnitz Reduction Works, by which the winter's stock of charcoal was lost, only 124 tons of copper were made—so that a host of charges fell on this quantity which should have been divided on a full year's production. The year 1874 produced 175 tons of copper.

COST PER TON OF COPPER, 1875.

| | |
|--|-----------|
| Officers, storekeepers, and watchers | £ 2 12 8½ |
| Transport of ores to the works | 3 10 1 |
| Smelting to mattes | 29 3 2 |
| Roasting the mattes | 1 9 0 |
| Fusion to black copper | 3 15 11½ |
| Driving blast machines | 0 6 8½ |
| Transport of copper to the Danube | 0 18 4½ |

Total

In 1876 copper has been made much cheaper in consequence of richer ores. There is now no charge for steam-power, as the reservoir constructed in 1875 has supplied plenty of power for blast. The raffinage of the crude copper by means of the rosetting hearth costs about 3*l.* 18*s.* per ton, whilst in the *spleisssofen* it is partially refined at an expense of 2*l.* 14*s.* It must be admitted that 4*l.* 16*s.* is a large amount for the production of 1 ton of Chili bars; but it must be remembered that, although nominally the ores averaged in 1875 about 4 per cent. of copper, yet the large percentage of crystallised water they contained reduced the actual value of the ores to 3-4 per cent., and that to procure 1 ton of copper 30 tons of ores had to be smelted. Taking the average of the whole year, 3797 tons of ores smelted have cost 29*s.* 7*d.* per ton; if, however, the expense of the transport of the ores to the smelting-works and the salaries of the officers be omitted then the cost per ton remains at 22*s.* 9*d.*

From these data anyone may calculate the cost of reducing in the Castilian furnace any percentage of ore; of course, the description of mineral raised, and the wages of the district in which the mine may be situated have to be taken into account; but, considering the unfavourable conditions existing at Maidanpek, especially the refractory nature of the ores and inefficient workmen, it is improbable that the costs of production would be so high as those given.

It may be interesting to mention that the cost in 1875 to produce 4 per cent. ore sufficient to make 1 ton of copper amounted to 18*l.*, but this included all explorations, officers, and materials. At present the expenses both of raising ores and of reducing them is considerably less than in the year above mentioned, and in addition the ores themselves have so risen in produce as to admit of their reduction at a very fair profit.

CHEMICAL REDUCTION.

Although the deposits of Maidanpek enclose rich ores, still the lenticular masses of minerals contain for the most part ores varying from 3 to 4 per cent., and as we have seen above that ores of 4 per cent. require a total expenditure of 59*l.* 16*s.* to make 1 ton of copper it is evident that the margin of profit is too small to treat these ores by the dry method, consequently they have for the past few years been allowed to accumulate in the stopes, to await a cheaper method of reduction.

During 1876 important experiments were made to test the practicability of reducing these ores by a wet process, and, although the varied character of the ores to be treated presented great difficulties yet a method of reducing them has been attained, and a copper precipitate of over 90 per cent. produced. Should the state of political

affairs permit it is proposed to replace the smelting to a great extent by this new process, which promises to be so successful.

EMPRESSARIO.

P.S.—Permit me to observe that I am not the individual who has lately been advertising in the Journal for a situation under the *nom de plume* I have assumed.

THE MINING INDUSTRY OF CHILE—No. I.

SIR,—Having recently arrived from the Republic of Chile, I am in a position to give you some interesting items in reference to the great progress which has been made in this go-ahead country since I left it some 20 years back, and especially in the mining line. It is surprising to find this little Republic still continuing to produce more copper than all the rest of the world together. Statistics prove that Chile turns out 60 per cent. of all the copper produced in the world. The causes of the great prosperity of mining in Chile are very simple, and easily understood.—1. The great accessibility of its mines by easy and short roads from the coast, the inexpensive railways, and the facility with which they are built, Nature placing such few obstructions in the way. Most of the valleys and rivers run east and west to the shores of the Pacific. One of these narrow-gauge railways from the coast to the foot of the Andes will prove the aforesaid accessibility. I copy a paragraph from the Chilean Times of March 28, and the original of which I enclose. In the *Serena*, a town in the Province of Coquimbo, the newspaper says—"We can state positively that the project conceived some months ago with respect to a railway to Elqui will shortly be realised, thanks to Mr. Charles Lambert, son of the rich Swansea smelter, who has recently left a fortune of 1,600,000*l.* made in this Province in his copper mines and smelting works, who has authorised his representative to call a meeting of the shareholders already inscribed; and in case of certain eventualities on their part, he is disposed to carry out this most important work entirely on his own account. It is estimated the road will cost about 80,000*l.*, and the distance to Elqui is about 45 miles." In consequence of these facts the mining population have now taken up many mines on the projected line, and amongst others the well-known Porotos Lead and Silver Mines.

It is also the intention of the Chilean Government to have the rest of these valleys to the foot of the Andes surveyed, with the object of granting permission for the construction of narrow-gauge railways in order to facilitate and cheapen the transport of material, provisions, and freights to the coast. The second cause of the prosperity of mining is that Chile is a great agricultural country, producing so much wheat that a great portion is exported to Liverpool. Labour, in consequence, is cheap, and everything else in proportion. Chile produces about 500,000 tons per year of good smelting and steam coal, supplying also Peru, Bolivia, and all the West Coast. Almost all the copper smelting in Chile is carried on with Chilean coal, and there is hardly a railway in the country that uses anything but Chilean coal. I also enclose a long paragraph with reference to the discovery of extensive nitrate beds in Chile, which you can publish in a separate letter or paragraph.

HENRY SEWELL, M.E., F.R.G.S.

10, Upper Westbourne-terrace, London, May 16.

DISCOVERY OF EXTENSIVE NITRATE DEPOSITS.

MINERAL WEALTH OF CHILE.—The much-debated question whether Chile really possesses nitrate deposits, or whether the reports hitherto given of them are simply the fabrications of designing persons bent on making Peruvian monopolists uncomfortable—as our northern neighbours insist on maintaining—will soon be set at rest, and that, too, we have reason to believe, in a satisfactory manner. The report of the engineer—Senor Vadilla—who was sent to survey and measure off the claims applied for at the place called Cachiñal de la Sierra, has been forwarded to the Minister of the Interior, and published in the Government Gazette, and gives a fuller account of the discoveries than has hitherto been made known. The deposits in question are three in number, situated to the south of the 25th parallel; the first at a distance of about 25 kilometres to the south-east of the port of Paposo; and the second and third in an extensive plain, calculated at 30 kilometres in length by 18 or 20 in width, running from east to west, and distant from the same port about 90 kilometres, in a south-east direction. Senor Vadilla examined all the land in which prospecting had taken place, a large number of holes having been put down at different distances, in all of which beds of nitrate were discovered. Under the sandy surface a stratum is found which is in parts sulphate of soda of tolerable purity, and in others a mass composed of sulphates and of caliche, mixed with the surface sand. Under this is situated the bed of nitrate, which is from half a metre to a metre and a half in thickness. The deposits are considered to be of great extent, being met with in all the holes sunk, and also wherever the earth was removed to the depth of half a metre by the inspecting engineer. The first deposit measured gave a superficial area of 1,500,000 square metres; the second, 8,000,000; and the third 11,000,000; or a total of 20,500,000 square metres. To obtain a fair approximation as to the quality of the caliche, samples were taken from various localities, mixed together, and analysed, the result being as follows:—

| | |
|--|----------------|
| Common result of the first deposit—ley | 51.5 per cent. |
| Do. do. second do. | 29.7 " |
| Do. do. third do. | 41.7 " |

"These leyes," says Senor Vadilla, "show the pure, anhydrous nitrate of soda contained in the caliche, and obtained not from isolated samples, but from a number taken on the field itself, and with all the care possible in such a locality. I have not assayed separately any of the samples which composed the collective one, containing scarcely traces of potash. There can be no doubt entertained whatever over the existence of nitrate deposits in Chile, and nitrate of good quality." With respect to the facilities of exportation, Senor Vadilla recommends the use of the Port of Talca in preference to that of Paposo, not only because of the difficulty of constructing a road to the latter place, but also because of the insecurity of the bay. According to his calculations the deposits are situated at only eight or ten leagues from the road leading from Cachiñal to Talca, to which a cart-way might be easily made, the country being level and the distance short—Taltal being, besides, a well sheltered bay, and with facilities for loading and discharging. After the very decisive and straightforward report of which the above is a brief epitome, even the most incredulous and interested person can scarcely refuse credit to the fact so clearly stated.—*Chilian Times*, March 28.

MINING IN NEWFOUNDLAND.

SIR,—Having a desire to place our long-neglected island home in a proper light before the mining world, and thus, perhaps, draw the attention of capitalists to our immense mineral resources, I purpose addressing you again, with the hope that you will favour me by inserting it in your valuable Journal. Until recent years Newfoundlanders have been depending almost entirely on codfish and seal for the means of subsistence, and, in consequence, our fortunes were ever varying and uncertain; at times we were a colony of rich men, at others the direst poverty and distress overtook the great bulk of our people. Now, however, by changes brought about by steam communication and other civilising influences, our trade is more certain and settled, and a large portion of our people are turning their attention to agriculture and mining.

Since last I wrote you we have had water communication with our northern outposts—the first of the season. The mining news, which is looked forward to with intense interest, continues to be of the most encouraging character. At the several mining locations worked copper is found in greater abundance as the work progresses, and promises to be ere long the most valuable of our exports. At Betts Cove the output continues to increase steadily, the present yield of the mine is about 250 tons a day, and the owners aim at a still higher figure on the opening of navigation, when labour can be obtained. Mr. Ellershausen, the energetic manager, hopes to ship 50,000 tons of copper ore during the coming season. It is impossible to foretell to what extent this extraordinary mine will be worked in the future; to all appearance it seems inexhaustible, as on every side throughout the sinkings and drifts nothing but a solid mass of copper ore is perceptible to the eye. Some folks estimate that to take out the ore now in sight at least three years will be required. According as the mine is developed the more wonderful it appears. Betts Cove is a small harbour on the northern shore of Notre Dame Bay, commonly called Green Bay, surrounded by immense hills, reaching from 600 to 800 ft. above the sea level. The present workings are situated on the western side of the harbour, and is literally a mountain of copper ore. The company are erecting several smelting furnaces, with the object of converting the poorer ores into regulus for shipment to the English market.

The fortunate owners of this immense treasure are two mining

gentlemen residing in Glasgow and Mr. Ellershausen. We wish them every success in their enterprise, as by their means attention will be directed to Newfoundland that will result ere long in placing her in the front rank of copper producing countries. Half-a-dozen such companies would be of untold advantage in developing the latent resources of "Terra Nova." I trust the day is not far distant when this land will become the busy home of ten thousand miners, and the copper workshop of the world.

As I surmised in my last letter, the Union Mine, Tilt Cove, is proving itself to be a valuable property. During the winter two new shafts were sunk at some distance from the old workings with a success truly gratifying to the proprietors; both shafts have opened valuable deposits of ore, which are expected to yield a large output at an early date. Very sad news, indeed, reaches us from South West Arm. Capt. Martyn, who took charge there last fall died very suddenly; he was much respected, and reported to be a man of great ability and large mining experience. His loss will be a serious drawback to the company. Latest mining reports from that quarter were very cheering, the lode had widened to 5 ft. and was yielding good returns. I understand the owners intend working with increased energy during the coming season.

The second company in South West Arm have not worked to any great extent throughout last winter, having had only four men at work on contract. It appears that the discovery was made too late last fall to allow of their having a larger crew at work, their intention is, however, to commence extensive operations as soon as spring opens. The vein they opened is very promising indeed; at the bottom of the shaft, which is 5 fms. deep, the lode shows 2½ ft. of pure copper ore and 2½ ft. of copper, quartz, and black slate mixed. There is every indication of a large and rich deposit being opened up on this property before many months roll along. At Rouge Harbour and Sandy Cove Island the lodes have not been found. Bunches of copper are taken out daily from both places, but no regular seam that would warrant a large outlay.

In my next letter I will treat of discoveries made in other parts of the country, consisting of grey sulphurets, ruby copper, and galena. Our legislators have closed their labours for another season, having accomplished some good, honest, and practical work. I have much pleasure in stating that a Bill was passed last session authorising a survey north and west to connect the mining centres with the capital by telegraph; this will be an incalculable boon to those interested in mining. Our Government is a liberal and progressive one, and well deserves the confidence and support of every lover of his country.—*St. John's, Newfoundland, May 3.* J. B.

ATMOSPHERIC INFLUENCE IN CONNECTION WITH COLLIERY EXPLOSIONS.

Sir,—In the article in last week's Journal on "Atmospheric Influence in Connection with Colliery Explosions," in which you freely quote from a paper read by me, I hasten to rectify an error that has unwittingly crept into it with regard to the relative densities of mercury and marsh gas. Instead of 26 to 1 it is in round numbers 20,000 to 1 against the mercurial column. That is to say, the mobility of the gas is 20,000 to 1 of the mercury, taking the two at a temperature of 60° Fahr. My argument on this point is that whenever the mercurial column shows a perceptible movement to the equivalent of this movement the gas has already acted. And to the extent of this movement the barometer indicates only what has taken place, and its virtual uses can only be an indication of what has taken place before its movement is perceptible.

Regarding the diagrams that are put on record, they show simply that the barometer was low or not low when an explosion takes place, and nothing more. Changeable as the condition of the atmosphere is it is not near so variable as the conditions of the interior of a working mine. The workings and roads of a mine may be free of gas at seven o'clock in the morning, and at eight the mine may be in a dangerous condition without the slightest variation in the atm. sphere. For instance, a weight may come on by the tendency of the roof to fall, and the enormous mass of roof press so heavily on the face of coal as to squeeze or press out the gas to a very large extent, so much so as to foul the pit to an explosive point. This and the thousand and one varying conditions incidental to a mine in full operation play a far greater part in the liability to an explosion than the changes in the atmospheric condition, and I cannot help thinking that too much prominence, followed by dependence, has been given to barometrical changes.

It is a fact, whether acknowledged or not, that the deputies and those having the daily charge of the interior of the mine look to the barometer, and are greatly guided by it, to the oversight of the varying conditions brought out by the operations in the mine. Our greatest dangers arise not from exterior causes, but from causes incidental to the operations. But when men of learning and a yielding Legislature give prominence to a cause that most certainly is no nearer than a possible one no wonder the probable and immediate causes are overlooked.—*Leeds, May 16.* JOHN WARBURTON.

ATMOSPHERIC INFLUENCE IN CONNECTION WITH COLLIERY EXPLOSIONS.

Sir,—The leading article in last week's Journal is suggestive of a few remarks on the above subject, which I beg leave to make in your columns. It seems to me that Mr. Warburton is not quite accurate in all his ideas, and that it would be a misfortune to allow any prejudices to arise against the use of scientific instruments to guard against explosions in coal mines. It is quite beside the mark to make comparisons between the specific gravities of mercury and marsh gas; the difference being much greater, by the way, than is stated in your columns. A barometer is simply a column of mercury balanced against the pressure of the air, and the high specific gravity of mercury has no other result than giving a shorter column of mercury and smaller oscillations in its level. The mercury will just yield as readily as marsh gas, but it may yield through a very small distance. Nor does the disparity of temperature between the barometer outside the mine and the gas inside the mine affect the efficacy of the former in the slightest degree. The barometer simply indicates the fluctuations of the atmospheric pressure, and this will make itself felt wherever the atmosphere permeates, irrespective of the difference of temperature. I know of a lime-stone cavern in a lead mine with a very narrow opening, and the air rushes out and in through this small aperture with a whistling sound, in perfect accordance with the rise and fall of the barometer.

To affirm that explosions do not always happen with a low barometer is to say that other causes have to do with the origin of explosions besides the atmospheric pressure. It is not a legitimate conclusion to say that the pressure of air has nothing to do with these catastrophes. Indeed, the figures quoted seem to prove the contrary. Of the 159 days on which explosions occurred during the year the barometer was rising on 49 days and falling on 70 days; the 40 remaining days on which the barometer was stationary it is unfair to group with the 49 days having a rising barometer. A falling barometer, therefore, all other causes ignored, stands guilty of explosions as against a rising barometer in the proportion of 70 to 49.

But the experiments of Mr. Thomas prove, as might have been confidently expected, that there is one other very active cause—temperature. Gas is evolved by a high temperature, and it is evident that if the temperature rise so much as to create gas within the coal having a greater tension than can be balanced by the increase of pressure of the atmosphere, a serious explosion may happen with a rising barometer. The lesson to be learned is not to throw away the barometer, but to read it in conjunction with the thermometer. All tables which connect explosions with the reading of one of these instruments alone must be deceptive. The following are the rules which I believe will be found to hold, and are the headings under which observed explosions should be grouped. The frequency of explosions are in the following order, beginning with the least:—

- 1.—With a rising barometer and a falling thermometer.
- 2.—With a stationary barometer and a falling thermometer.
- 3.—With a falling barometer and a falling thermometer.
- 4.—With a rising barometer and a high or rising thermometer.
- 5.—With a stationary barometer and a high or rising thermometer.
- 6.—With a falling barometer and a high or rising thermometer.

I think sufficient explanation of the greater number of explosions happening in winter can be found in the greater fluctuations of the barometer and thermometer without trenching on Mr. Warburton's rather novel ideas of absorption and radiation. DAVID BURNS.
Alston, May 17.

THE PREVENTIBILITY OF COLLIERY EXPLOSIONS.

Sir,—I have very carefully perused the leading article in last week's Journal, and although much may be said in favour of Mr. Warburton's views, it would be exceedingly dangerous to allow his arguments to upset all the valuable testimony, obtained at an enormous cost to the public, before various committees of both "Lords and Commons."

In my "Review of Colliery Explosions and Other Casualties," published in 1850, I gave from such testimony the most important points then and now at issue, including the well-known standard mixtures of atmospheric air and carburetted hydrogen gas, so as to produce either inflammability or explosion, with a further scale to indicate freedom from both under gradation of gas produced, the minimum being 20 of the former to 1 of the latter to keep the pit in a state of safety. If this be true, which nobody seems to deny, I cannot imagine what good is likely to result from disputing the efficacy of the barometer, and the introduction of an individual belief that temperature alone, regardless of atmospheric pressure, should be the future guide.

Then, as regards the experiments of Mr. Thomas, of Cardiff, he surely cannot believe that because he could only detect very little gas evolved from certain pieces of coal put under partial vacuum, or even when all air pressure was removed, it follows as a natural law in "star-dard coal" under immense pressure from above. If so, perhaps he can explain the precise cause of the exudation of gas into the air-ways from nothing but coal.

I have already supported my arguments by unquestionable authority that the maximum power of the furnace is to produce a speed of 3 ft. per second through an aperture of 40 ft. area, which is equal to 10,368,000 cubic feet of air in each period of 24 hours. That such a supply would only be equal to a change of air once in 24 hours in a pit excavated to the extent of 53 acres, but if such excavation be continued to 212 acres, then only once in four days, &c. We will, therefore, assume that no more than 53 acres can be safely wrought in a pit producing 5 per cent. of gas, but if such colliery is known to be giving off 20 per cent. of gas, and this is really the case in many of much greater dimensions, without the possibility of obtaining an increase of air supply to counteract it by any means at present in practice, we need not look far for the true cause of explosions. Whether such wholesale havoc of human life occurs most frequently when the barometer is low, with an increase of heat, or the reverse, is not the subject just now for discussion. I intend that the indisputable cause of mischief is the absence of air in sufficient quantity to remedy the evil, and that so long as the advocates of furnace ventilation adhere to this long existing and dearly cherished, but fallacious, practice, to the exclusion of all suggestions for improvement, explosions will not be prevented.

I am equally certain that carburetted hydrogen gas in collieries is not beyond the power of man to subdue, and that its destructive tendency may be conquered and controlled, even to its utilisation, if necessary, but never while furnace ventilation exists, or any other means which limit the supply or necessitate depression or expansion of the air within the pit.

All concerned in this momentous and gigantic question must be fully aware that it is impossible to fill the pit by any means of exhaustion at the upcast. They must also know that by closing the upcast shaft the pit may be filled by one or other of the well-known means of propulsion. I had adopted the most simple as I found it at Montague Main Colliery, Scotswood, near Newcastle-upon-Tyne, and by previous arrangement with its owner (Mr. W. Benson, of Hexham), on Feb. 1, 1862, I descended the colliery in question by means of a looped rope, or jack, owing to an accident to the usual machinery. The air is supplied by means of a common blast-furnace fan, 6 ft. by about 18 in., conveyed by a wooden box or case from the surface to the Beaumont seam 50 fms. (which is worked out), and from thence to the Three-quarter seam, about 18 fms. lower down, by an air-tight bratticed shaft, forming the upcast and downcast. I closed the former at the Beaumont seam, until by the barometer I ascertained an internal pressure equivalent to 16 lbs. per inch throughout the mine; and, believing from appearances in general, and the difficulty to prevent the clay stoppings around the platform upon the pit frame from being blown out, that a suitable atmosphere for all purposes was obtained, I removed the valve and covering, got the men up from below, and was pleased to learn from them that they had experienced no inconvenience whatever. They said the air was cool and comfortable, that it strongly rushed past them at intervals (when I removed the valve to examine the barometer), and that they should have no fear of gas with so much air in the pit as they had then experienced for the first time in their lives. The manager concurred, and the owner was much pleased to hear from their own lips the result of this first trial, he having arrived at the pit's mouth as we came to bank.

I must here stop to explain that your correspondent "M. E." is labouring under wrong impressions in supposing it necessary to compress the atmosphere before passing it into the pit, and this at an enormous expense for machinery with miles of costly pipes, of themselves always objectionable in collieries. I also beg to inform Mr. D. Burns that his suggestion of two distinct systems alternately by compression and expansion with same pit divided is long subsequent to mine, by which I have shown that it might be placed under such reversed conditions and thoroughly cleansed during the shift of men, or at any other reasonable time.

I do not remember the number of cubic feet of air per minute supplied by the fan, but when in the pit I thought it equal in strength and quantity to any other within my knowledge. It was considered a very safe pit, and I had but a few hours before been down another belonging to Mr. Thos. Young Hall, which was ventilated on the furnace principle. Still, I perfectly well remember that by stopping all escape upwards the enormous pressure of 16 lbs. to the inch was obtained in less than one hour; and, as one of the men said he felt a pressure upon the burrs of his ears as if some one was pressing his fingers upon them, I consider 16 lbs. to the inch suitable for all purposes, both as regards health and safety.

It is no longer a question of doubt that any quantity of air can be forced into a pit so as to fill it throughout its entire ramifications. This has never yet been done by any other means nor by any other person than myself, and I confidently aver that whatever degree of compression may be determined on as most desirable for the health, personal comfort, and safety of the miners I will convince all who may be present at the next experiment that the air may be circulated and changed without undue speed of the current; but to be regulated in its exit to the supply, whatever may be the maximum of the propelling power.

Assuming this to be possible, I humbly ask whether or not I have made out a case worthy of notice? Can such a state of things ever be accomplished by means of traction? and, finally, whether those who have the power possess also the inclination to encourage and facilitate investigation by witnessing a more extended experiment in any pit ventilated upon the propulsive principle.

Southdown, Yarmouth, May 16.

C. COLWELL.

ROCK DRILLS.

Sir,—In reply to Sir G. W. Denys' communication on "Rock Drills," in the *Mining Journal* of last week, I have to say that though there was an objection in the case of his level to driving day and night, it is the usual practice in Northumberland, Durham, and other mining districts to drive stone drifts continuously—that is, by three shifts of men in 24 hours. By this means not only is a given length of drift driven in at least one-third of the time, but at the same price per fathom, without interest of capital being taken into consideration. I should say the same class of workmen will be engaged in working with rock-drills as with hand labour, and in the boring of holes the workman will exercise his judgment as much in one case as in the other. The advantage of rock drilling is the speed with which holes are made in comparison with hand-labour

—it may be as 10 to 1, or in a greater ratio. After the holes are drilled—suppose to the same depth—the workman calculates how much dynamite or other explosive is required to bring down the material. He will use pretty much the same whether the holes are drilled by hand or by machine.

PATENTS IN THE GERMAN EMPIRE.

Sir,—The new Imperial German Patent Law having just been accepted by the Reichstag, and coming into force on July 1, warrants you an epitome, which will no doubt be interesting to your readers. The new law prescribes that patents now existing in the German States cannot be prolonged, but may be converted into Imperial patents. Thus a Bavarian or Alsatian patent may be extended to the whole empire if the invention were really novel and has lawfully employed an invention before the grant of the Imperial patent, this latter does not prevent him from continuing to use it. Subjoined is the

EPITOME OF THE NEW LAW.

This new law puts an end to the disorder concerning patents in Germany which has existed until now, at the present time there being 21 different States patenting of their own. These will be all embraced by one law after July 1, and this a good and practicable one, far better than many now in force in the countries.

Pharmaceutical compounds, medicines, alimentary preparations, and other products cannot be patented under the new law; processes, however, if they have been introduced to the public, so that another person can imitate them. Imported inventions are not patentable—that is to say, only to the real inventor. It is unlawful to manufacture a patent article, to import the same from abroad, or even to use a patented machine, tool, apparatus, or process, unless having an invention in use cannot be prevented from continuing to use the same. A patent is procurable for 15 years; the taxes are 50 marks (2½ l.) for the first year, 50 marks (2½ l.) for the second, 100 marks (5 l.) for the third, and so on, with an addition of 50 marks each year; thus a 15 years patent costs 1,250 marks (62½ l.). Patents of addition are granted at a cost of 50 marks. The taxes are paid three months after date. Patent rights may be withdrawn by the inventor after three years if the invention has not been carried into operation to the proper extent, or if the inventor has not taken the necessary steps to carry the patent into effect, if he refuses licenses to others who offer a fair royalty, and if it is advisable for the public good to grant such licenses. Anyone having obtained a patent for improvements on a patented article, and not wanting a license from the first inventor, is obliged to give the latter a license for his improvements. Foreigners must empower a German citizen to make their applications.

The applications will be examined by the Patent Commissioners, and experts pointed for this purpose; an appeal can be made in case of refusal to the Patent Commissioner, and from him to the Imperial Court at Leipzig. The fees of poor inventors the payment of taxes will be postponed for two years, or altogether remitted.

Specifications and drawings can be inspected immediately after the application (on account of this, patents should be taken in other countries first).

Patents being delivered, a short specification of the invention must be published in the Patent Journal. Before the lapse of a patent notice has to be given to the inventor, and a proper time allowed him to fulfil the requirements of the law. Infractions of patent rights are punished with a fine up to 1,000 marks (50 l.), or imprisonment not exceeding one year. Marking articles as patented without a patent, or so is punished with a fine of 150 marks (7½ l.). Upon the publication of the patent, anyone thinking he has a prior right may enter an opposition, which will then be examined in the presence of those concerned.

Existing German patents may be transferred to the Empire, but cannot be prolonged.

For an application for a German patent it is necessary to send a legalised power of attorney to a resident German subject (if the inventor is not a resident) or to a resident German subject (if the inventor is not a resident) (representative) drawings—if the invention admits of them—and descriptions in duplicate; the addition of models or samples is advisable. The usual fee for an application, including 2000 words of translation, is 100 marks, or 5 l., so that the interests of inventors can be secured on reasonable terms. WIRTH and Co., Patent Agents.
Frankfurt-on-Main, May 15.

CARDIGANSHIRE MINES, A.D. 1877—No. XV.

Sir,—I have to begin this letter by stating that neither at West Blaen-dyffryn, Blaen-dyffryn, or Nant-yr-Arian Mines have anything been done for the last three years. The Blaen-dyffryn is worthy of a trial. At Nanty Cria, during the last two or three months, they have made a start to clean out and put the mine and machinery in a state of repair, which must, from the time it was suspended, have got into a very bad state. When, however, it has been put into good working order, it cannot fail to pay very handsome profits, at the price of blende does not greatly recede. At West Nanty Cria very little work has been done; however, from the trials made, enough has been seen to convince anyone who has had a connection with Cardiganshire mining that it is a very valuable piece of ground, and only wants a moderate amount of capital to develop a lastingly remunerative mine, and it is to be hoped that some party may be found disposed to join the present company for this object, which I hear from the best authority, are disposed to treat with anyone inclined to do so for the object here alluded to.

At Esgair Gwionin the little that has been done shows good prospects, and should capital be found to work it I believe a successful result would be realised.

At the Crown Mine some good lead and blende ores have been found in driving an adit near the surface, and from the masterly appearance of the vein it will, in all probability, make great deposits of lead ore as depth is attained.

At East Llwyn Teify little or nothing has been done during the past three years. At the Temple Mine a deeper adit has been extended into the ore ground discovered in the level above, and a capital of 5000 l. would make this a lasting dividend-paying mine. At Llwyn Teify little has been done for some time past: 5000 l. properly and judiciously expended here could not fail to open out one of the richest mines ever worked in Cardiganshire.

At the Aberystwith Mines some rich ore ground has been opened out at the deepest point that any portion of the vein has ever been wrought, and which has been opened on for some miles in length, thus proving that the deeper the vein is seen the richer it becomes, and speaking well for the mines adjoining it—Old Ystumant, Tyny-iron, and Troedriw Sebon Mines, of which I hope to treat pretty fully in my next.

Goginan, Aberystwith, May 16.

THE GROWTH OF METALS.

Sir,—I was much struck by the extraordinary statements contained in the notice in last week's *Mining Journal* of Mr. Readwin's paper on "Mineral Growth at Ordinary Temperatures, under Ordinary Conditions," more especially as it seems that the growth is supposed to take place in copper and silver, as well as gold. Gold has always been known to increase whenever a sufficient interest is taken by those possessing it to induce them to study the question of gold production, and corresponding instances are on record with regard to silver. But with regard to copper the matter has been different, for although the Vivians, the Williamses, and a few as manipulated it as to obtain some gold from absolutely non-aureiferous copper they obtained no satisfactory evidence of the growth of copper itself; the natural consequence being that they were compelled to purchase all they manipulated. But to avoid confusion it will be better to take one metal at a time. Let us begin with gold. We are told that there is visible evidence of the growth of gold in the specimens both in the Aberdeen Museum and in the Liverpool Free Museum, whilst even a shawl pin of gold from Dolfrwynog shows visible growth in scarcely more than 20 years. Referring to the Dolfrwynog, Cwm Isea, Cwmheisian, or some of them certainly, Mr. John Bright, or some of his friends, could give indisputable evidence, for they could readily declare with regard to at least one Welsh gold mine how much gold they put in and how much they got out; the difference would, of course, accurately represent the amount of growth. As Mr. Readwin is also well acquainted with the auriferous productiveness of the district, he could, no doubt, state which mine would supply the most conclusive evidence.

Assuming the probability of the visible growth at ordinary temperatures, and under ordinary conditions, to be ascertained, the next step should be to verify the observations, and it is by no means easy to suggest how this verification could be effected. The first question is whether the shawl pin which came into existence in 1856, and has, therefore, just attained its majority, has ceased growing? Next, whether the growth of the gold has abstracted anything from the materials surrounding, whether matrix or setting?

it have abstracted nothing from these it must then be ascertained that there has been no oxidation of the metal to account for the growth, and hydrogenium must be looked for, since assuming growth to have taken place there must certainly be some increase of weight to have 21 years old weights more than a new born babe—which can readily be ascertained with such balances as are now in use. If the difference of weight be found, the so-called growth may be due to the altered position of the molecules of the metal, which, again, may be due to exterior physical causes—the handling by museum servants or curators, and so on; the growth being consequently quite a myth. Such statements as the visible growth of metals require to be accepted with quite as much caution as those of perpetual motion, effecting the transmutation of metals.

ASPHALT.

ROMAN GRAVELS MINE.

SIR,—May I ask you to allow me to draw the attention of the shareholders in the above mine to the expediency of urging the directors, at the approaching meeting, to adopt the system so successfully pursued by the managers of the Van Mine in regard to sales at quarterly periods. I feel sure that the payment of a regular quarterly dividend, however small, goes further in establishing confidence with the public than even a high rate of interest at very uncertain intervals.

Those persons who bought Roman Gravels shares on the understanding that dividends would be paid four-monthly have been sadly disappointed, and advantage should be taken of the approaching meeting to insist on a division of profits every quarter.

SHAREHOLDER.

HOME MINING—BRITISH METALLIFEROUS MINES.

SIR,—The dividend mines recognised and dealt in upon the London and other Exchanges for the year 1876 were 29 in number—the subscribed capital being 991,204. 6s. 10d., and the dividends paid for the year 191,469. 7s. 9d.—say an average of 19 1/2 per cent. These mines had up to the close of 1876 yielded gains to the shareholders of 3,320,913. 1/2, which is equal to rather over 3 1/2 fold the entire outlay. During the past year 17 lead and blende mines yielded 25,235 tons of lead ores, which averaged about 16 1/2 per ton, and 466,032. 12s. 1d. in money, and 15,960 tons of blende realised 55,690. 0s. 10d., equal to 3. 13s. 6d. a ton. The dividends declared upon these 17 metalliferous lead and blende mines were 145,915. 1/2, equal to 3 1/2 per cent. on the gross yield of the ores. The cost of extraction, dressing, and carriage, with royalties, was thus close on 68 1/2 per cent. of the gross returns named (218,793. 11s. 11d.).

The tin and copper mines were 12 in number, 11 of which are situated in Cornwall, and one in Cheshire; those mines declared dividends for the year 1876 of 45,554. 6s. 9d. upon a gross yield of 253,717. 11s. 2d., being 17 7/10ths per cent. of the products. The costs, therefore, of working even the dividend mines in Cornwall is 32 1/10ths of the entire products. The mines are mostly deep, and steam machinery is in general use, so that costs are sadly enhanced when compared with the depth of many of the lead and blende mines, and the inexpensive adaptation of water-power in discharge of ores and debris from underground, drainage, with dressing operations at surface.

We may mention that the Van declared dividends of 49,500. 0s. 11 1/2d. outlay, and in a few years has divided profits of 308,625. 1/2. This property is marketable at 600,000. 0s. for the entirety—equal in both respects to 14 3/10ths fold for all the capital of the company, or 14 1/2 per cent. for every 1. subscribed. Adjoining this mine is the Van Combe and Glyn; and, judging from the reports, and the large amount of lead and blende returned from the first coupled, and with the low market quotations of both companies, the purchase at this epoch in their career, can scarcely fail to remunerate the investor. West Chiverton Lead Mine, in Cornwall—the present price is 16. 10s. per share, and as the dividends for 1876 were 20s. per share, purchasers will, probably, receive 6 per cent. interest on current quotations.

The yield for the year was 1645 tons of lead ore, of the value of 20,545. 9s. 5d., and over double the quantity of blende—3300 tons, worth 9987. 9s. 10d. Thus the dividend (30000. 0s.) is just 9 1/2 per cent. of the yield, and sprung solely from the demand for spelter and the consequent enhanced value of the blende—black-jack, a mineral formerly regarded as of slight value, and not unfrequently thrown away as worthless. The great demand for spelter in the manufacture of zinc-plates and utensils of late years has given this product a really commercial worth, and, in fact, is the vital resuscitation of West Chiverton.

The copper and tin mines in Cornwall are chiefly confined to the centres of the Caradons and the Gwennap and Carn Brea groups. The dividend mines for 1876 were—Tincroft 6000. 11 per cent. on the capital, the aggregate dividend being 258,000. 0s. up to the close of the year; Dolcoath yielded dividends of 6381. 0s. 13s. 9d. per cent., the entire profits having been 475,510. 0s. on a capital of 45,252. 1/2; East Pool on a capital of 3120. 0s. declared dividends of 4960. (say) 15 1/2 per cent., and in the aggregate since the opening of the mines in or about the year 1835 have been 3187 per cent. on the capital, or over 77 per cent. annually for a period of 41 years—1835 to 1876—and the property is now selling for 20. 0s. to every 1. sterling subscribed; South Condurrow yielded dividends of 2998. 0s. and is likely to become a great and important mine, and especially so should tin return to its normal value. In former times this district was the first in Cornwall for yield of copper and of dividends, while the development of Penstruthal and Cathedral bids fair to equal the best of the district. Penstruthal shares are now 10s. to 12s. 6d., yet investors fight shy of this mine. At one time, and just before achieving success, shares in Tresavean sold at 1s., yet they continued to advance up to 2700. each, and declared dividends of 6000. annually on each 32. 10s. share, or over 150 per cent. monthly. Other mines in the same district have proved equally prosperous and profitable, as may be instanced in Wheal Basset and Buller. The Penstruthal yielded gains of 130,000. from one lode alone, and the present operations show all the elements of prospective success. There is an early and substantial prize here, and also at Cathedral, and shares at the present time are neglected, and selling at prices that cannot but remunerate capitalists. West Wheal Tolgus and West Pollice are also two profitable copper mines. At Liskeard we have the East Caradon, South Caradon, and Caradon (Glasgow). These mines have respectively paid 14. 19s. on 2. 14s. 6d. per share, 734. on 1. 5s. per share, and lastly 12s. 4d. on 1. 5s. per share, or taking the group East Caradon has paid 545 per cent.; South Caradon, 58,720 per cent.; and Glasgow Caradon, 82 per cent. on the capital involved.

We would, in conclusion, direct the attention of our readers and those who are desirous of embarking in legitimate mining, and not gambling share transactions for settlement on account days, to Penstruthal, New Cook's Kitchen, Cathedral, Glyn, Van, Van Consols, South Crofty, Peavor, South Condurrow, Grogwinion, and Great West Van. Leadhills, in Lanarkshire, is now the prize of the year 1876. In September last the mines were purchased and formed into a company with 120,000. capital, and forthwith floated on the London market. Already a dividend of 6s. per share has been paid; the future yield will augment, yet at present the profits are about 1500. monthly, equal to 18,000. annually; from 270 to 290 tons of lead ores monthly—15 per cent. on the subscribed capital. The shares are 20,000. of 6d. fully paid up, and sell at 1/2 to 3/4 prem. The ores in reserve and laid open are valued at 150,000. to 175,000. The concession is five miles square, and the operations are comparatively in their infancy. The lodes are numerous, 30 and upwards, though workings are restricted to five alone. The Raik vein is 3 to 4 ft. wide, at times "solid lead ore," and is uniformly productive—30 cwt. up to 9, 12, and even 14 tons to the fathom, worth 14. a ton. Brown lode is valued at 30 cwt. to 3 and 5 tons per fathom. Brown's lode yields 30 to 40 cwt. a fathom, and is of great promise. Susanna and Humby veins have been highly productive so far as wrought, and whenever a deeper section is opened out in length the product will unquestionably become great. The executive is powerful and practical—one of the directors has, in fact, a seat on the board of the Devon Great Consols, which, in all likelihood, will soon resume dividends. He sits on the board of Tankerville and the Great Laxey, in the Isle of Man, and is auditor of the Roman Gravels, which announces the payment of another dividend of 8s. 6d. a share. This gentleman has had great experience with large and

exceptionally profitable mines in Cornwall, Shropshire, Isle of Man, and in Scotland, extending over the last "three decades." We may add, in conclusion, that the mining public are indebted to Mr. Peter Watson for introducing the Leadhills upon the London Exchanges, as sound, bona fide concerns are alone required to counteract ruling depression. This property possesses far more prospective promise, and discoveries already developed, than the "Van" did when first introduced as a public company. If the executive and the proprietary co-operate with the director referred to, Leadhills may soon rival the Van in product and profits. In such an advent may we enquire the figure—founded on inherent worth—the market price of shares will attain.

R. TREDINNICK.

Mining Engineer and Dealer in Stocks and Shares.

12 A, Finsbury-square, May 15.

MINING IN THE ST. AGNES DISTRICT.

SIR,—It is true that mining in this district has for some time been comparatively dead, and yet when one reckons up the mines about it may be asked, how can it be so dead when compared with many districts? Your readers would do well to ask the shopkeepers and miners, and the tale would be told. The present price of tin, no doubt, is the great cause, but there are other causes damaging and most painfully felt by the miner and the trade which might be discussed to advantage. A reference to some of the mines would not, perhaps, be uninteresting.

Wheal Kitty is at present the principal tin mine working in the parish, and is employing a number of hands. It is true that there is a certain kind of economy practised here, but such an economy as to send many a poor miner home to his family with a tear in his eye instead of a smile on his countenance.

Penhalls, adjoining Wheal Kitty, is what fairly may be termed a "tinny bal," and the manager is looked upon as desiring to do justice between adventurer and man. The lodes are very irregular, and sometimes scarcely to be defined, so that rich deposits or runs may be found in a day. Dividends to the extent of nearly 20,000. have been made from tin raised and sold from this uncertain ground, and it is to be hoped that ere long the adventurers will realise a fresh dividend.

New St. Agnes.—This mine, as a going concern, is offered for sale by auction, and it is to be hoped that such a sale will be effected as will secure the effectual working. New St. Agnes would certainly have the best of Wheal Kitty, and with a judicious laying out of additional capital would ultimately pay well.

Wheal Coates may well be called a tin mine. Here all operations have been suspended, except the sinking of the engine-shaft. There has been a great deal of tin returned from this mine, yet it appears that the capital is all expended. If the mine had been properly worked it would not now be in its present position; but on the contrary, and notwithstanding the present low price of tin, would at least be paying cost if not giving a small dividend. However it is to be hoped that additional capital will be raised and entrusted in good hands, when practical and profitable results must inevitably follow.

Charlotte United Mines.—But little is doing here, and but little seems to be known of the company. It is a kindly speculation for copper, and those who may have spent, or are spending, their money should have a reliable authority at the helm, and trust him, or grief may be the result. The manager—Capt. Bennetts, of Penhalls—is certainly a very respectable trustworthy man, but whatever the respectability or ability of a man may be, unless certain local fetters and annoyances are taken from him, public confidence will be wanting, and the adventure suffer.

East Tywarthaile (near Mount Hawke).—Can it possibly be true that from 3000. to 4000. has been expended here? It was stated that the company was a Bri-tol one. By-the-by, there was about 140. worth of copper sold at the last ticketing at Redruth as "Champion's ore;" the question has been asked if it came from this mine, it being stated that copper had been broken, dressed, and sold.

Trevithick Mine, also near Mount Hawke.—This is a very desirable copper sett, and we are glad to learn that some men are set to work not merely for the sake of the neighbourhood, but for the legitimate adventure. Capital judiciously laid out here will not be lost, but be a safe investment.

CORRESPONDENT.

Cornwall, May 14.

PARYS MOUNTAIN MINE—(COPPER, &c.)

SIR,—The special meeting of this mine being just over, and success becoming a certainty now, by the sale of the Morfaddu property, inasmuch as it enables the manager to get under the quarry referred to at the meeting, where no less than five millions sterling were netted in profits. It is remarkable that the spring of water in the bottom of this place is so strongly impregnated with copper that it rapidly destroys the iron pumps. In my letters I have referred to the last discovery through the deposits of copper observed in the stream flowing from this part of the mine so far back as 1764, and here we have another deposit without doubt to be shortly exposed. I now propose to offer a slight sketch of this interesting and mighty property, which just now may be particularly worthy of note to the numerous body of shareholders and others. The present time appears to be the turning point in the history of this company, and its success may now justly be looked forward to with great satisfaction. I would, therefore, strongly urge holders of these shares not to let these securities slip out of their possession on any account. The nominal price of shares at this time is no guarantee of the intrinsic value of the property or of its future. This price is now representing a 3. share fully paid and limited, being far below the approximate value. So late as June only these shares changed hands freely at 14, without these immediate chances of unlimited wealth. The mine has an aggregate of 33 or 37 tons per fathom of copper ore, and 11 tons of munda, and should now arrest the attention of speculators. There are also 11 pitches worked by 18 men in addition. The stopes in the 90, the 80, 65 east of rise, the 65 over the same, the 45 at the back, the 45 east of rise, and the 45 east of cross-course are worth according to Capt. Mitchell—a good authority—4 and 5 tons of copper ore, besides 1 and 2 tons of sulphur per fathom, with promise of improvement.

In addition, we find that the stoping out the lode inside of the level at the 45 fm. level yields no less than 6 tons of copper ore per fathom and 3 tons of sulphur. I herewith briefly show the value of the mine, without reference to further discoveries. To drive the 90 cross-cut south, to get under the great open cross-course, should now be carried out vigorously; this point is believed by all acquainted with the property to be a splendid speculation, and worthy of the unanimous and generous support of the numerous and influential proprietary. The mine sold 300 tons of copper ore last month. The lode in the engine-shaft east was worth from 2 to 2 1/2 tons of copper ore per fathom (in good patches). We have here a mine of no ordinary degree rich in copper ore and sulphur to an extraordinary amount, and with a united and spirited policy the shares would at once return to their approximate value. The sale of the Morfaddu portion of the mine, to be worked as a bluestone quarry, &c., would place Parys Mountain on a firm basis of prosperity for the future, and settle the question of its anticipated and certain success, most deservedly one of the mightiest mining properties of Wales. Without doubt Parys Mountain will become a favourite channel of investment, and we may anticipate a rising market shortly. Situated in Anglesey, this mountain has been called a "British Burra." So far back as the reign of Queen Elizabeth a patent was granted to certain parties to work the mine, when it was left in neglect for 150 years. In 1762 Sir Nicholas Bayley was induced to work it, but having no pumping machinery the water soon overflowed the workings. Two years after this Messrs. Roe took a lease of the mine, unwillingly being compelled to take in part of this (Parys) mountain in the writings or deed of another mine, and to carry on a level, and a fair trial. Success was nearly abandoned here also at this time, but for the pluck of the manager, who continued to search for the golden treasure at about 800 yards eastwards of a place called "Golden Venture," believing that a spring of water, which issued from near the place, must come from a large body of ore at hand. He was right; for in less than two days they met, at only 7 ft. from the surface, solid mineral, which is now marked as a festival in North Wales by the miners—March 2, 1768!

The second portion is the most wonderful, and no description, however graphic, can convey an adequate idea of the wonders of this abyss, not concealed by a crust of earth, but open and exposed. Here a mighty ruin is exposed to the eye also! "Standing at the edge of the excavation," says a well-known writer, "the spectator beholds an awful range of huge caverns, profound hollows, stupendous arches, gloomy passages, and enormous masses of rock, and amid this striking scenery the miners are engaged in their curious but perilous occupations; some sticking to the sides of the rock, or seated on narrow ledges of the precipices, which gape beneath them to the depth of 100 or 200 ft., tearing the ore from the mountain and breaking it into smaller masses, others boring the rock in order to blast it, whilst a third party, hanging over the abyss literally, are drawing up and lowering the ore buckets, supported only by a frame of woodwork, which quivers like an aspen leaf. Ever and anon we heard loud explosions rattling through the profound darkness, echoing and re-echoing through the passages and caverns, exciting the mind of the astonished gazers." Precipitate is prepared in these mines, and is almost, if not quite, of equal value with the native copper. From the reduced ores red and yellow ochre is made in quantities, so wonderfully productive is Parys Mountain Mine. To all shareholders I say, therefore, "Hold on to your shares."

London, May 15.

MINING SPECULATOR.

PARYS MOUNTAIN MINING COMPANY.

SIR,—The report of Parys Mountain this week is very encouraging indeed. I note that the 90 cross-cut south is improving further, stopes looking well, and at the Maria Mine the lode lately cut is turning out splendidly, yielding large bodies of copper ore. There now seems a handsome future for this adventure. In the prospect of a better copper market we could at once return all expenses in the management and produce, and drive the 90 south under the quarry. Copper is coming into Morfaddu sett, about to be taken up, which is very important indeed. With such a past history Parys Mountain ought to repeat itself, and cut rich as in olden days, when 5,000,000. was made from the mass of ore of which the mountain is composed. The meeting appears to have been very encouraging indeed, and the Chairman said that they had nearly paid their way but for the painfully low price of copper. The dark claret-coloured mineral water flowing from the spring clearly indicates masses of copper ore at hand. No property stands a better chance of becoming a rich prize a second time than this mine. At the next meeting to be convened great hopes are entertained of a unanimous effort to carry out the very unusually great expectations now clearly visible to all. The miners in the locality are anticipating with much glee a returning prosperity to the great copper hill, and many a Welsh hearth and home will be gladdened by the cutting again of an exhaustless mass of ore now so well known to exist and to be so near at hand.—London, May 17.

MINE INVESTOR.

PARYS MOUNTAIN COPPER MINING COMPANY.

SIR,—A very favourable opinion for a great strike of ore may be formed from the reports issued from the late special meeting held in London. If 5,000,000. sterling could be gained, why should not this piece of good fortune occur again? The stream, so unusually thick from copper deposits issuing from the quarry portion of the mine, seems to prove that this fact is about to be verified. The present riches and future prospects of this adventure, together with the enormously rich locality (as is considered to be proved beyond doubt), show very clearly that the mine is in a far better condition than when 3. (all paid) was the quotation. Of course, another strike of copper would prove such a stimulus to the Mining Market as has not been known for a century. There is now plenty of capital in hand to vigorously carry out these magnificent operations, and without doubt bring to a more than ever successful termination one of the finest enterprises extant.—Brighton, May 15.

MINE OBSERVER.

WEST CHIVERTON MINE.

SIR,—Is it true that at the meeting of shareholders, held last week, credit was taken for all the mineral sold up to the 2nd inst., while the cost was not brought forward beyond Feb. 24 last? If so, must there not have been two-and-a-half months cost totally unprovided for on the day of the meeting? And is not this precisely a similar state of things to that Mr. Granville Sharp so vigorously denounces when in connection with mines which happen not to be in his office?—Redruth, May 17.

W. TREGAY.

SUCCESS FOR CORNISH MINES.

SIR,—It not unfrequently happens that depression in any given branch of industry turns out to its ultimate advantage owing to the improvements and increased economy to which it gives rise; and from the feeling now being exhibited by Cornish miners, it is not improbable that the same results may accrue to Cornwall from the long period of inactivity they have passed through. One instance of this movement is afforded by the paper on "The Present Mode of Conducting Cornish Mines, and the Improvements necessary to enable us to Contend with Foreign Competition," read before the Mining Institute of Cornwall, by Mr. W. H. Rule, of Camborne, the leading proposition in which was that the success or non-success of any undertaking depends entirely on the manner in which the undertaking is conducted; and he shows that mining as a branch of industry, and also as a speculation, has nothad the fair trial it deserves. He does not insinuate that the agents are deficient in ability, and he maintains that Cornish miners are second to none in the world, but he shows that miners in Cornwall do not work as in other countries, and he explains the reason. He also says that Cornish mine agents have not felt the independence they ought, and the properties are not managed as if they were the agents' own.

The payment of large purchase money to middle men is very properly condemned. Formerly this was done principally in connection with limited companies; but he adds that of late years something similar to this has been carried on with regard to the Cost-Book System—a speculator, without a farthing to lose, securing the lease of a mine sett, re-sells to a company at a heavy premium. Mr. Rule remarks that it is disgraceful that shareholders should pay 20 per cent. more than is necessary for their supplies, simply because a particular firm has a large interest in the undertaking. He mentions that the agent can retain his position while he continues to please the merchants, but that if he complains either of price or quality of the supplies he is either politely invited to take the control of a mine far off, or is discharged altogether. The utility of visiting agents is pointed out, very truly remarking that if he can be spared for six or eight weeks at a time, he can be well spared altogether. Mr. Rule also refers to the small amount of work done by "owners' account" men, and suggests that owners' account work should be limited as much as possible; altogether he says—weed out the idle, and encourage the industrious man.

Referring to his old subject of coal supply, he shows that mines which are paying 17s. per ton for coals could obtain them direct for 13s. per ton. He pointed out that Dolcoath was consuming 700 to 800 of coals per month; West Seton, 400; West Frances, 200; Grenville, 300; and Cook's Kitchen, 200—1800 tons per month in all. He proposes the formation of a co-operative society in 18 shares, each of the five mines taking one share for each 100 tons of coals per month consumed, to purchase a steamer for their own, and provide trucks of their own. Mr. Rule thinks that the (300 ton) steamer might be bought by the issue on the joint guarantee of the five mines, of 4000. debenture, at 5 or, to be safe, 6 per cent. interest; and the redemption hire of truck, to be on the safe side, he puts at 180. per annum. He estimates the steamer to make six journeys per month, and the outlay then stands at 135. per month for debenture interest, working expenses (the estimate is 86. 1/2, but he puts it at 100. 1/2), and insurance. This is equivalent to 1s. per ton on the 1800 tons; he, however, puts this at 1s. 6d., and puts the railway mileage rate at double also, yet the total is only brought up to 11s. 6d., delivered on the mines. He calls this 12s., which still shows 5s. per ton profit to the miners, representing a monthly saving at Dolcoath of 175. 1/2; West Seton, 100. 1/2; West Frances, 50. 1/2; Cook's Kitchen, 50. 1/2; and Wheal Grenville, 75. 1/2. In conclusion, he says that nothing short of import-

ing their own coals, smelting their own tin, and using every possible effort to work as economically as practicable so as to return their produce in as clean and perfect condition, and with as little cost as possible, will enable Cornwall to exist as a tin-producing county.
London, May 9. A MINING BROKER.

ST. PATRICK MINE.

SIR.—I note by the reports lately issued by Capt. Wm. Francis, manager of this mine, situated amongst a group of rich lead producing properties, and in one of the most productive localities in England or Wales, that a great change is at hand, and lead may now be hourly struck in large bodies. The inexpensive working of the mine is very remarkable, the drivages being so easy, and not one shilling is expended or has been in draining it. The area is extensive, and the 120 yard cross-course is now from 3 to 4 feet wide in the drirage, with firm walls, and has every appearance of approaching a body of ore. If this proves correct, as believed by some of the best experts, the shareholders may find a rich harvest indeed at home. The 60 yard in the chert is also most encouraging for flats of lead, and is approaching St. George's to the north, which yielded half a million profit, with lead at only 8s. per ton. LEAD MINER.

THE LADYWELL MINE, AND ITS MANAGEMENT.

SIR.—The irritated shareholder who wrote in last week's Journal has no right to blame the manager. That the mine is a good one all the managers in the district are agreed, but it is undeveloped, and the manager has had no chance yet of doing the mine or himself justice. If the capital that has been raised in shares had been placed in the manager's hands to develop the mine we should, no doubt, have seen the same masterly development as at its neighbour, the Roman Gravel. In the old days of mining in this district parties who subscribed capital spent it on the mines, and looked to legitimate mining for returns; now, notoriously, two-thirds of the capital subscribed is first divided amongst the promoters. Under this modern system the manager has no chance with the residue of developing a mine, unless it has been previously sunk deep enough at once to pay its way, as was the case with the Roman Gravel. The 20 tons a month are obtained literally from the surface, and it is merely a truism to say that until a mine in this district is sunk below 60 fathoms no one expects it to pay. Everyone agrees in believing the Ladywell will pay well when the manager is enabled to work the mine as it ought to be worked, and if the shareholder can induce the promoters to give the manager sufficient power—i.e., money for the purpose, the better for the manager, the shareholders, and themselves. It may gratify your correspondent and others to know that a new shaft is being sunk on their mine, and if this is followed by a new engine the productiveness of the mine will in all probability be effectively shown. A SHAREHOLDER.
May 16.

CAPT. TREGAY, AND PEDN-AN-DREA MINES.

SIR.—I did not intend to move further in this matter, having merely written my previous letter with the object of correcting certain misstatements on the part of "W. X." and Mr. Granville Sharp which were too erroneous to be allowed to pass unchallenged. Whilst I feel certain that these gentlemen were only actuated by the highest and most disinterested motives in constituting themselves the immaculate censors of commercial morality, and whilst feeling that their own moral qualifications for such a post would on investigation prove unblemished, I cannot but regret that in working so strenuously for the public weal they should have commenced with a case manifestly so far beyond their powers to establish. Anyone who has seen two puny and envious children with their mouths watering for unattainable sweets, vainly trying to upset an apparently empty sugar hogshead, into which their more active and intelligent companions had clambered, will appreciate the unenviable position of "W. X." and Mr. Granville Sharp.

"W. X." tries to hit from the shoulder, but he cannot box a bit. Every new combatant who enters the arena is "grossly ignorant," knows nothing of the matter in question, his sword is blunt, his armour vulnerable in every joint. "W. X." and "W. X." alone, with Mr. Sancho Panza, Mr. Granville Sharp, is competent to settle matters; and there, so far as his powers of proof or argument are concerned, the matter ends. "W. X." starts off as though the balance-sheet from 1875 had left a clean book, but this is far from the reality. The company's balance-sheets in the printed and published circular to the shareholders from 1875 show as follows:—Liabilities: To merchants, 7194l. 1s. 4d.; to bankers, 1019l. 14s. 1d.; lord's dues, 277l. 0s. 7d.; total, 8490l. 16s. 1d. So that clearly, on a call being then made of 7015l. 19s. 7d., a clean balance of 1475l. 10s. would be left against the company, instead of 1091l. 6s. 7d. in its favour. This would of itself bring a balance of 2566l. 16s. 7d. against the position which "W. X." is so determined on assuming. "W. X." literary services would be invaluable to the editor of the Englishman, but he is not a success as an accountant. Animated like the hero of Cervantes by the purest of motives, he charges windmills, which prove too many for him, and, like the hero of Cervantes, whilst rolling sorely on the ground, he, too, can see no absurdity in his position.

Even in the logical efforts which "W. X." defines as "the long and the short of it," he is, as usual, hopelessly wrong. Of the 100,000l. which he asserts to have been called up under Capt. Tregay's management 34,741l. 11s. 10d. was called up by the company before Capt. Tregay ever entered their service. This, I think, shows a further slight discrepancy of 35 per cent. in "W. X." accounts, but the only thing that surprises me is that his inaccuracy is not greater.

In answer to Mr. Granville Sharp's question—Why must a balance have been struck in February?—I may observe that in the balance-sheet for 1875 we have total sales of black tin 331,377l. 16s. 6d., and in the balance-sheet for March, 1876, we have black tin, as per last statement, 340,567l. 7s. 6d. If no account appeared between these two balance-sheets whence this difference of 9187l. 11s. 2d.? I could give more reasons why must be written, but I think that the above figures speak for themselves. ARGUS.
May 16.

CAPTAIN TREGAY, AND HIS APOLOGISTS.

SIR.—Captain Tregay cannot be congratulated on his apologists. Besides having a strong disregard for facts, they profess principles that are not generally considered sound or legitimate; but then, perhaps, they were thought all the more appropriate advocates for this case. The one called "Phib's" has specially irregular ideas. He evidently cannot have read the correspondence which has appeared in the Journal, or he could not have made the remark that "W. X." and Mr. Granville Sharp "restrain from making any statements as much as possible." On the contrary, their letters have been bristled with facts and figures, which Capt. Tregay and his friends have not only evaded, but by garbling them have tried to suggest conclusions contrary to the truth. They think Capt. Tregay ought not to be asked the questions put to him. Now, what are the circumstances? Some time ago Mr. Granville Sharp said something publicly about the fate of Pedn-an-drea Mine, at which Captain Tregay rushed into print in the shape of a long letter in the Journal. The matter was not only in this way made a public one, but for the sake of the whole body of shareholders in the late company, and in the interests of mining generally, it was important that the explanations should be as clear as possible, and one would have thought Captain Tregay would have taken care to make them so. He has not done so. It is not denied that for upwards of 20 years Captain Tregay managed the mines for the late company, during which the calls on the shareholders amounted to more than 100,000l., and though the price of tin was much above what it is now, or has been for the last ten months, the whole dividends amounted to only 1423l. It is also admitted that Capt. Tregay was the purchaser of the mine and machinery last autumn for 2500l., and that since then he has become (to use his own words) "a considerable gainer by the change." I see that the present company is stated to be in 6000 shares, of 5l. each, which are quoted at 7l., and it may be that Captain Tregay's profits have arisen from the sale of shares, but as some people say he is making profits by the working of the mine, surely Capt. Tregay

cannot be surprised at the curiosity to learn (particularly among the old shareholders) whether this is really the case, and, if so, how he has managed to accomplish this satisfactory result for himself, in a few months, under great disadvantage, when for 20 years he had been so unsuccessful for others, though favoured with much better prices for the produce. Instead of frankly answering this, Captain Tregay has carefully avoided the point, launching out into abuse and irrelevant remarks, which have done him as much harm as anything said by "W. X." and Mr. Sharp. There are other important and pertinent questions which Captain Tregay has also evaded, while he has occupied considerable space in the Journal in trying to pick holes in some details, on which, even if he is right, it does not alter the main facts. The way in which he has treated the whole matter has not certainly done him credit, and has fully justified the raising of the questions.—May 14. W. C. P.

CWM DWYFOR MINE.

SIR.—I am glad to find that this mine has, with created Nature all about, after a season of somnolence, begun to show some signs of life—a life, it is hoped, which need not for long depend on external support, but will find in itself elements which are destined to raise it into a state of independence and power. There is no reason to be assigned why it should not be so; but there are reasons to expect that it will, notwithstanding the many difficulties that have opposed its progress during the past, pay back to its indefatigable promoters and subscribers their well-merited reward. The opening of the 20 fm. level is looked upon with great anxiety, especially as there is said to be a good course of lead gone down in the bottom of the 10; but if this should not turn out according to their hopes, what then? Why, they are not dependent upon this one lode—this is only one amongst many which have every appearance of productiveness. I have been informed that the reason of their not starting earlier with the new company was their having to wait the return of the manager from Spain, who had been employed by some influential gentlemen to go there to inspect for them a great number of mines all over the country—mines of silver, copper, antimony, iron, asbestos, &c. The company have reason to congratulate themselves on their good fortune to be able to retain his services, although they may have to pay a little more than they would have to a lower class man. Nothing can be a greater mistake than for mining companies to think that cheap men are the cheapest; sound practical men, with a thorough education, are the best men, and even if they have the wages of two of some so-called mine captains they will do more work, and do it better. From what I can learn of the manager of Cwm Dwyfor he is one of the right sort, who looks after the interests of the shareholders, and knowing the mine as I do I have no doubt that he will bring them to a successful issue. JOAN CWM.

Meetings of Public Companies.

EBERHARDT AND AURORA MINING COMPANY.

The seventh annual general meeting of shareholders was held at the City Terminus Hotel, Cannon-street, on Thursday, Mr. E. L. J. RIDSDALE in the chair.

Mr. ALFRED CRITCHETT (the secretary) read the notice calling the meeting. The minutes of the last meeting and reports were taken as read.

The CHAIRMAN rose to propose the adoption of the balance-sheet, which was circulated amongst the shareholders some time ago. In the circular which was sent out at the same time the directors informed the shareholders that the present meeting would be of somewhat a formal character, for the purpose of passing the accounts, because in consequence of the very voluminous report which Capt. Drake wrote under date of Feb. 23, and which had also been sent to the shareholders, there was very little left for him to say on the present occasion, and nothing to add to the report which could in any way enlighten them as to the progress of affairs at the mine. The shareholders were aware that at the last meeting, when a small dividend was declared, he told them that as soon as any new strike was made the board would be prepared to divide some more of the money which they had in hand as a reserve, not only for all contingencies which might occur, but also for the purpose of driving this tunnel, which was of such vital importance to the mine, and also for prosecuting the incline which was to meet the mine in the angle shown on the map. In a telegram which he read at the last meeting, Capt. Drake stated he had got on a body of ore which promised to be permanent, but they would remember that he (the Chairman) told them it would not be advisable to attach too much importance to that statement, because until the first bodies of ore were completely explored, and were thoroughly tested by various drivings in different directions, it was impossible to know how far that body of ore extended. Unfortunately, as the shareholders were aware from telegrams which had been published since, that body of ore did not turn out to be such a large body as Capt. Drake then imagined, and in consequence they had simply gone on driving the tunnel, driving the incline, and also prospecting as far as they could in those levels where they had hitherto extracted the body of ore which they had been working upon in the last year. To-day the board had received a telegram, which he would read later on, which, however, did not contain much more information than they had hitherto had; it was simply to the effect that Capt. Drake was getting small bodies of ore out of the old chamber, but he did not as yet propose to start the mill, as he had not got out a sufficient body of ore to make a continuous run. When the mill was shut in winter, and the hands discharged, it was to obviate the expense which would be incurred in keeping the mill open during that time, and Capt. Drake had not been able, during the time which had elapsed since it was shut down, to extract a sufficient body of ore to set the mill going. Capt. Drake had been driving the tunnel and incline, and employing all the available force upon those two points; but as soon as sufficient ore was got out to make a continuous run work would be commenced in that direction. But they would go on for the present extracting ore until they had got sufficient to make a continuous run for the mill. (Hear, hear.) Referring to the balance sheet, he said it would be seen that the balance from the mining revenue account was 28,560l. 18s. 4d.; the produce by bullion was 106,633l. 8s. 4d., which was reduced by charges of freight, brokerage, reclamation for brittle bars and depreciation to 91,668l. 18s. 10s., which was the whole amount which the bullion had realised during the past year. The amount of depreciation—10,623l. 11s. 11d.—which seemed a very large sum, was caused by the fact (which no doubt they were aware of) that silver had fluctuated enormously in price; during the past year it had fluctuated from about 47d. per ounce to 59l. per ounce, or a fluctuation of about 1s. per ounce, which was a very large amount. The price of silver was always estimated at the mine at a fixed figure, but when it was sold here they simply took credit for the amount realised, and that was the reason why the depreciation appeared so large. Of course it was impossible to estimate a fluctuating article like silver at an absolutely fixed price at the mine. If they had only got the ordinary amount of value for their silver which they had been in the habit of doing hitherto the very large item of depreciation of 10,623l. 11s. 11d. would not have appeared in the accounts. When the mine was first started they were selling silver at 5s. 1d. per ounce. As regarded the finances in this country the accounts were made up to Dec. 31, 1876, and of course, the present financial position was somewhat different to that represented in the accounts. They had now in hand a reserve fund, invested in Government stock, amounting to 20,500l., and they had in the bank 12,500l., which made a total of 33,000l. cash assets, and they had paid all the expenses in Nevada up to June. The incline which they were driving down to meet the tunnel was 1200 feet down, and there were about 800 ft. more to go before they reached the level which would intersect the tunnel. The tunnel had been driven in 1140 ft., and up to the present date it had been all paid for. They had about 800 ft. more to drive before they got under those various mining claims which were portrayed on the map before them. There were one or two points more which he would refer to. It would be interesting to the shareholders to know that there had been taken out

of the mine altogether 629,000l. sterling of silver. Now, the reasons for undertaking the tunnel, which was a very extensive work indeed, were so important that he thought he ought to touch upon them before putting the balance-sheet to the meeting. The shareholders were aware, because the subject had often been mentioned at these meetings before, that the deposit of silver in these pipes was of a very fluctuating quality, and the directors were obliged to keep as large a reserve as possible in hand to enable them to meet occurrences which might happen when the ore was thin, and when it developed into a larger, more important, and defined body. When the mine was first bought by the company specimens of ore were brought over to this country, and there was one large specimen which, probably, some of the shareholders might have seen in Mr. Haggard's offices in Austin Friars, which he had had seen in Mr. own office, and it assayed 9900 to the ton. These deposits were of that quality; it was generally in the cores that they struck an enormous amount, but even supposing that it ran to such a body of ore only averaging 1000 to the ton, one month's run, taking it at 50 tons a day (which the mill generally crushes) one month's capital of the company, and that was the reason why, rather than pay an immediate dividend, the directors decided to run the tunnel in order to get the ore at the great depth at which it was believed to exist, and which they could not otherwise reach except at enormous expenses in going down. There was an almost parallel case, as the Californian Mine, on the Comstock lode; he saw by the New York papers that the dividend paid in that mine last year, the share which were selling at about \$3 per share when this company started, was the almost incredible amount of 2,500,000l. sterling, which was an amount almost taking the breath away. They would find that they never got any riches until they got 1500 ft. down, and it was the knowledge of that fact which induced the directors of this company to drive a tunnel at a great depth in order to try and intersect the lode at the depth at which they expected to find them. Of course, the ore on the surface must come from somewhere, and experts considered that it must have come up from the bottom, and that lower in depth they would meet with very much larger veins of ore. In a mining property of this kind it was right to bear in mind the chance of obtaining an immense prize of the character which had been referred to, and that was one of the main reasons which had influenced the directors so much in deciding to drive this tunnel, and spending money in developing the property in depth. He had gone somewhat at length into this subject, because it was one in which they were all interested, and if they had (as they would have to do) gone with a small dividend for a short time, it was, as he hoped, only in order that they might spend some of the money which they had got in reserve in order to develop what he believed, and what Capt. Drake believed, and what all who knew anything of the neighbourhood believed were the great riches which existed in depths in Treasure Hill. (Cheers.) The tunnel which had been driven was under nearly all the mines, and it was almost impossible that in running the tunnel under all those mines they would not come upon some of the great wealth which had been manifested to such a large extent even in the surface deposits. (Hear, hear.) In conclusion, he (the Chairman) moved the adoption of the accounts, and said he should be happy to answer any questions.—Mr. APPLEGARTH seconded the resolution.

Mr. T. G. TAYLOR said that Capt. Drake in his recent report stated that he was still taking out ore; the shareholders would like to know whether the ore was in sufficient quantity to justify its being taken down, and whether they were in a position to work such ore?—The CHAIRMAN said that he would answer that by reading the telegram which had that day been received from Capt. Drake, and which he had referred to in his opening remarks. The telegram was as follows:—"Still the same ore in old chamber; it is not sufficient to warrant starting the mill at present." He might mention that as far as an inspection of the sheet went he had been raising from 80 to 160 tons per week out of old chambers. The telegram went on—"Incline progressing well, drift east 1100, level 44, start on drift 1200 level." That meant Capt. Drake had gone down 1200 ft. in the incline, and was starting drifting at that level. The telegram concluded as follows:—"No particular change; good breaking ground, and indicating favourably for ore. The tunnel is in 1140 ft., had occasionally mixture of quartz; hardness of rock not materially changed; machinery and mill working well." There was not much in that telegram. Capt. Drake was getting what ore he could, and was prospecting as far as he was able.

Mr. T. G. TAYLOR said there was another point on which he would make a remark. He thought the shareholders scarcely understood the way in which they would be affected by the find of ore in course of the tunnel. It was expected that they would strike the ore before they got to their own Eberhardt property, and he believed that according to American law whatever ore was found in driving the tunnel became the property of this company until the owners of the mine above had sunk down to prove that the company was actually working away at their lode. As he understood it the company could go on taking as much ore as they liked until they were interrupted; but even supposing it was proved that the company was working the ore of other properties, those persons instead of trying to get at the ore by means of a shaft would be only too glad to pay this company for the use of its tramway to run the cars down to the place where the ore was situated. Perhaps it would be desirable if the directors would give some information to the shareholders generally on the point which he had mentioned, because if he were right in the view he had taken it was a very satisfactory feature in connection with the sinking of that tunnel.

The CHAIRMAN: I think, Mr. Taylor, we had better not discuss the subject as to whom the ore in the tunnel belongs until we strike it, when we consider that the Richmond Company had some difficulty with their ore. We have in Capt. Drake a man who is competent to grapple with any difficulties which may arise, and he has such control over everything which exists there in Treasure Hill that I have very little fear in the matter. (Hear, hear.) I do not think we had better discuss the matter, because any opinion which we may form will not influence the question one way or the other. I shall be only too glad to hear that the ore has been struck in other property, even before we get to our own, and no doubt Capt. Drake will give us all the benefit which is to be got out of it. (Hear, hear.)

Mr. PRITCHARD: Do I understand you that all the expenses are paid up to June? The CHAIRMAN said everything was paid to June 1 in advance—tunnel and all. He thought they would all agree that this was the best balance-sheet that had ever been presented to the shareholders. There was only one dividend paid down here, 1882, but the shareholders had really had in the course of the year 1100 ft. of the form of dividends, because they had had 5s. and also 3s., but the last dividend was paid on Jan. 4, and so more fairly belonged to the present year than the past. The report was then adopted.

On the motion of the CHAIRMAN, seconded by Mr. HAMMOND, the retiring directors, Messrs. William Baxter and Edward Applegarth, were re-elected. The CHAIRMAN said the next business was the re-election of auditors—Mr. J. H. Hale and Mr. S. Slater. Those gentlemen had always performed their duty well, and no doubt the shareholders would unanimously re-elect them.

On the motion of Mr. STEVENSON, seconded by Mr. TAYLOR, the auditors were then re-elected, with the same remuneration as before. The CHAIRMAN said that concluded the business of the meeting, but he should be happy to answer any question which any shareholder might wish to put. The directors were now waiting for a strike in the tunnel or the incline. The shareholders must have a little faith. He had great faith himself that they would make a really good strike in the tunnel before very long. They were also driving on the incline and in the levels, and he hoped they should shortly come upon one of those large bodies of ore, which during the whole time they had been at one of those seven years, they had been looking for. The company had a reserve fund of 33,000l. in hand, which would last a long time, and he hoped before they met again they would have some very satisfactory news, to the effect that they had got a good big strike in the tunnel, and that the ores were turning out rich; they would then resume dividends, and would see the shares at a very different price to what they were at present. Let the shareholders consider for a short time what an effect it would be if they were merely to strike the ordinary body of ore, and thus show that they had the stuff in depth, which the directors believed was there. It would infuse new life and faith into all, and they would be only too delighted to see all their hopes and anticipations realised. Captain Drake had been at it in striking the ore in depth. They were only about 1000 feet in at present, but at any time, and at any hour, they might strike upon one of the deposits which he hoped would yield them larger profits than they had hitherto extracted.

Mr. APPLEGARTH said he had long ago stated that they were almost certain to come upon rich ore in the deep. There was a prevailing idea in this country that in the limestone formation the ore was only found in pockets, was very uncertain, and never lasted for any great length of time. Now, for his own part, he never believed that idea. He might mention that his friend, Mr. Henry Sewell, had just come over from Chili, and had brought home the specimens of ore which were now before him on the table. These specimens were taken from exactly the same kind of limestone, and of precisely the same period as that which existed at the Eberhardt and Aurora; the same class of ore existed on the surface. As they went they went through a barren strike of ground for several hundred feet, and then they came upon the rich stuff which he now held in his hand—ruby silver ore, yielding several thousand pounds per ton, and in the centre they got tons of native silver in beds. They had been taking this ore out.

Mr. HENRY SEWELL, M.E., F.R.G.S., said it was not what they "had been" taking out, but what was actually being taken out at present. He pointed out that the Chili Mines had been worked for about 63 years, and was, therefore, a country in which the greatest amount of experience had been gained with respect to limestone formations. He had worked and had charge of mines in the district from 1851 to 1857, and some four years ago, when he was in the United States, he wrote a long letter to the Mining Journal with respect to the supposed deposit in the limestone formation of the White Pine district. Endeavouring to prove that (four years back, in 1871) that White Pine, when properly understood as a geological formation, would eventually prove to be a great mass of rich ore as in Chili. He added to this letter geological sections and plans of the mines in the limestone formations of Chili, which had returned over 150,000,000 lb. of ore.

Mr. APPLEGARTH went on to say, that judging from the formation of the Chili mines, to which he had referred, from the quality of ore they had on the surface, and to the quality they had got below, it would, indeed, be a very hard case if they did not get a similar thing in the Eberhardt and Aurora. He did not think there was a place, or very few places at any rate, in America, and he did not

the CHAIRMAN said he was very glad that it had been proposed, because he knew that the agents had worked well and honestly, and that the emergency to which reference had been made they were in the mine almost day and night. Reports were circulated at the time to the effect that the mine would scarcely ever again be in fork, but they were never deterred by any rumours of that kind, and their efforts were crowned with complete success.—The resolution was carried unanimously, and Mr. BLANEY, reverting to what had fallen from the Chairman, said some of his friends had told him that Peavor would never work again, as it was regularly swamped.—Capt. WHITE said the same reports had reached him, but he never had any anxiety about the matter. When the water broke in he gave instructions to the men to nail and raft every bit of timber together so that the pitwork should be unaffected by the water, and he was glad to say that from the time they commenced until they had finished draining the mine they never had a single let or hindrance. He was happy to state, also, that the mine was never in a position, both underground and at surface, than it was at this moment. During the last eight or ten months they had been involved in heavy expenses in laying out their dressing floors and erecting their stamps, but this expenditure was now pretty well over, and they had got into a fair position. What they were raising at present upon their south lode was merely from their ends and winzes, but when they got their ground laid open they would be able to work at a much cheaper rate and to materially increase their returns. The lode in the 60 never looked better; it was the full size of the end; they could not at present tell how large it was, and he hoped they would not know until they got to the end of the boundary. The 70 was in about 26 fms., and that end was worth quite as much and rather more than the 60. In fact, in the whole of the winzes, from the 60 to the present depth, they had a splendid lode, both east and west, and it was the best piece of ground he had seen since he had been connected with the mine. (Applause.) They had their costs during the past two months, and but for the drowning of the mine they would have done so for the whole period. He hoped they would be quite able to meet their expenses in the future, and any rise in the price of tin would enable them at once to make a profit.—The report and accounts were passed, and the sum of three guineas annually was voted to the Miners' Hospital.—A vote of thanks to the Chairman brought the meeting to a close.—*Western Daily Mercury.*

SOUTH TOLCARNE MINING COMPANY.

A general meeting of shareholders was held at the offices of the company, Austinfrs., on Thursday.

Mr. C. CLARK in the chair.

The notice convening the meeting and the minutes of the last were read and confirmed.

Mr. J. HICKY (the secretary) read the statement of accounts, charging costs to April 14, which showed a credit balance of 157l. 16s. 8d. The agent's report was as follows:—

May 15.—Since your general meeting we have extended the 50 cross-cut north 4 ft. 6 in., and out through the flat lode then reported on. Finding this flat lode to be unproductive, and that Fraser's lode had been passed over in the 30 cross-cut some six months previously, we began to open east on its course, and have already driven east on it nearly 40 fms. The lode throughout has been of good width, and has yielded occasionally capital stones of copper ore, but hitherto it has not produced ore in sufficient quantities to pay for working. The 50 east is driven further in this direction than any other level in the mine; but there is now some 240 fms. in length of unexplored ground to reach the eastern boundary towards South Condarrow. The 40 east, on Fraser's lode, is not yet drained. We are rising in back of the 50 with the view to communicate these levels, which will give good ventilation and prove the lode. The rise referred to is up 5 fms., but the lode is unproductive. If the 50 east, on Fraser's lode, does not speedily improve we would advise putting out a cross-cut from the eastern end to intersect the flat lode at a point further east. It is, in our opinion, necessary to do this so as to try to make a good discovery in this part of the mine before we recommend the sinking of the engine-shaft.

We have driven the adit east on the north gossan lode a few fathoms, and have had rich stones of copper ore. We consider the prospects at the adit warrant the opening of this lode deeper to prove it under the fine gossan seen at the adit, especially as there is a shaft already sunk 24 fms. below adit, which can be made available for pumping and hauling through. Keeping this in view, we are putting down a line of rods from the engine-shaft to the gossan shaft already mentioned, and hope in about three or four weeks to set these rods to work so as to begin to drain the gossan shaft below the adit. We have to state that this gossan lode has yielded very rich copper taken up by the tributaries from the bottom of the adit as deep as they could go for the water. We have cross-cut the ground at surface near the eastern boundary, and have opened on the back of a large lode. From its character and position we take this to be the South Condarrow great tin lode. It has yielded excellent stones of tin near the surface in the pit we have already opened, but it appears as if the trial we have sunk in on a cross-course. We have a large well-defined lode in the eastern part of the pit, and yielding tin, but it is apparently cut off going west by the small cross-course. We are trying to find the lode west of this cross-course, and as soon as we have done so shall be able to determine a definite course of action. In the meantime we intend to push on with the flat rods to the gossan shaft, as well as the opening in the back of the lode. Looking at the prospects of the gossan shaft, and that the South Condarrow lode is probably productive in the shallow levels in that mine, and in the ends going west, there is reason to hope that similar results will also be obtained if the shareholders will persevere in South Tolcarne.—W. RICH, W. HAMBLY.

A call of 5s. per share was made. The committee of management were re-elected, with the addition of Capt. C. R. Fraser.

A vote of thanks to the Chairman terminated the proceedings.

WEST WHEEL SETON MINING COMPANY.

A four-monthly meeting of adventurers was held, on Tuesday, at the mine.—Mr. THOS. PRYOR, the purser, presiding. The accounts showed a profit for the four months' working of 755l. 8s. 8d. At the last meeting there was a debit balance of 441l., but this was reduced to about 400l. by a call of 7l. per share which was then made, realising 4010l., so that the balance now in favour of the mine is 394l.

The CHAIRMAN stated the call of 7l. per share which was made at the last meeting had been wonderfully well responded to. Only about 300 remained unpaid at the present moment, and he had no doubt that before the accounts went out at least one-half of this would be paid in. He thought this spoke very highly for the shareholders who were connected with the mine. (Hear, hear.) Shortly after the last meeting he received a letter from Mr. Basset, stating that as the 2500l. which he gave up in dues for the erection of the new engine had been recouped, he was prepared to reduce the dues from 1-18th to 1-20th. This was quite unsolicited, and was only a continuation of Mr. Basset's well-known liberality, which entitled him to their warmest thanks.

The agent's report said:—The 165 is driven nearly 50 fms. west of Mitchell's shaft; the lode has hitherto been unproductive, but is now improving in appearance, and produces some good stones of tin. We may reasonably expect an improvement in this end shortly, as we are now approaching the point where the 120 began to be more productive. The 150, west of Mitchell's shaft, has passed through a good lode since the last account, having been worth on an average about 35s. per fathom for copper and tin. The lode in the present end is worth about 25s. per fathom. We are driving the 150 east of cross-cut, west of Mitchell's shaft, preparatory to sinking a winze from this level to the 185. The lode in this end is worth 15s. per fathom for tin. The 140, west of Mitchell's shaft, is producing good stones of copper ore. This end, as stated at the last account, is not improbably on the canter lode, which was intersected in the 102 cross-cut at New Wheel Seton. The 140 west is now about 50 fms. short of that cross-cut. About 50 fms. further west a shaft was sunk 25 fms. below surface by the New Seton adventurers, and we think it most advisable that the sinking of this shaft be at once resumed, in order to explore the lode in this new and promising part of the mine. The winze from the 180 to the 165 of Harvey's shaft is holed, and has opened up a good piece of tin ground, which is now at stake. We are driving a cross-cut at the 140 intersect this part, which we expect to do in about a month.—North Lode: The 165 east is producing good stones of copper ore. The 140, east of Mitchell's shaft, has much improved of late, and is now worth for copper 15s. per fathom. We have 60 men stopping for tin and copper, and 120 men on tribute.

Capt. JOSIAH THOMAS supplemented the report by stating that during the last four months they had sampled a larger quantity of tin than was ever raised before in the same period. The price, unfortunately, had been very low, but if it had been the same this quarter as it was two years ago, when they came to the mine, they would have made a profit of upwards of 5000l. more than they had done at this moment.—(Hear, hear.)—Although even at this time they considered that the price of tin was very low. The principal point in the mine to which the agents had always directed the attention of the adventurers was the western part, in the new and unexplored ground, and in the summer time he thought they might be able to sink the new shaft without any machinery. In his opinion it was advisable to put some men there immediately. He thought there was every reason to expect a good deposit of copper in that part; at any rate, it was well worthy of being tried.

Mr. RULE said he was very strongly of opinion that the shaft should be sunk at once, and—Capt. THOMAS agreed. It was all new and unexplored ground, and he should like to have the opinion of the adventurers as to the desirability of sinking the shaft in that western part.—Mr. CLYMA asked what the probable cost would be?—Capt. THOMAS replied that it would cost about 300l. a month.—Mr. MAYNE: What is your opinion with regard to it?—Capt. THOMAS: I am very strongly in favour of it. (Hear, hear.) I would rather do that than any other thing in the mine. (Applause.) It is a most important thing in the way of exploration.

Mr. CARTER asked Capt. Thomas whether he would not be likely to make considerably more progress if they had a boring machine in the mine?—Capt. THOMAS replied that they could work at least three times as fast with a boring machine than they could by hand labour, but the cost of erecting the machinery would have to be taken into consideration.—Mr. RULE asked whether there was any probability that the patentees of the various boring machines which were offered to the public would contract to drive the western levels?—Capt. THOMAS said he was doubtful if they would erect the machinery.—Mr. RULE: But supposing we went to the expense of erecting the machinery?—Capt. THOMAS: Then there would be no advantage to us in contracting. I believe that in a few years time people will no more think of working a mine without boring machinery than they will of doing it without a pumping engine, but it is, perhaps, rather premature for us as yet to have a boring machine at West Seton. Nearly all the makers claim that their machine is the best, and we may shortly have one that is better than the Barrow borer which we have at Dolcoath. But there is no doubt in the world that we can drive three times as fast by the boring machine than we can by hand labour.—Mr. LOAM: And save one-fifth of the cost. (Hear, hear.)

It was then resolved that the work of sinking the shaft in the western part should be proceeded with without delay.

Mr. RULE called attention to the desirability of the mine tendering for its supplies. He said he had no desire to press his views upon the adventurers if the majority of those present were opposed to them, but seeing that in four months

they consumed something like 3000l. worth of materials, he certainly thought that if they adopted the system of tendering and paid their merchants, if possible, every three months, a very material saving might be effected, and they would get their supplies at a much cheaper rate than at present. At East Pool they contracted to keep their stamps in repair at so much per month, and the result had proved that it did not cost them half so much as before.—Mr. HOLMAN stated that the price of materials had gone down considerably since that contract was entered into.—Mr. RULE thought the experiment was worth trying for three or six months. If it did not answer at the end of that time they could revert to the old system.—Mr. LOAM explained that whenever there was any work of importance to be done on the mine they always tendered for it, but there were many lesser matters which they could not tender for, and with regard to which the agents exercised their own discretion and judgment. He had never heard that the agents had failed to protect the interests of the adventurers in making their purchases, and, therefore, he did not see the necessity of the suggested change.

Mr. TREGLOWN was opposed to tendering. He knew that at East Pool they regretted having adopted the system.—Capt. THOMAS said he had no feeling either one way or the other on the matter, and he was quite prepared to act upon Mr. Rule's suggestion if it was the general wish of the adventurers. But he had tried tendering several times, and he had never found that any advantage was to be derived from it.—Mr. HARVEY thought it was better to leave the matter in the hands of the agents. The adventurers might depend upon it that respectable merchants would not prepare special prices for one particular mine, and, therefore, he did not see how the experiment could answer.—The PURSER said that the supplies at West Tolgar were tendered for, but the prices at West Seton bore very favourable comparison with those of West Tolgar.—The subject then dropped, it being understood that Capt. THOMAS would have the repairs of the stamps for three months tendered for in order to see how the experiment answered.

A short discussion ensued as to the disposal of the credit balance of 394l.—Mr. RULE said he had no doubt there were shareholders present who would like to see a dividend paid, but it became a question as to how far it would be politic to do so, seeing that if they paid a dividend of 10s. per share—and they could not well do less—they would have a very small balance to carry forward. (Hear, hear.) It had been thought by some that a dividend of 1l. per share would have been paid that day, but that, of course, was not possible, because their profit of 188l. had been largely reduced by the deficit which was brought forward from the last account. At the same time they had such excellent prospects before them that he was quite sure at the next account they would be in a much more favourable position. Their merchants' bills, which were charged up to the end of February, would probably not be so large, for their consumption of coals, in consequence of their having obtained a better quality, had been reduced to such an extent as to bring about a saving of something like 800l. a month, and he thought also that they might look forward to their labour costs being greatly reduced in the future. Altogether, then, the outlook was most favourable. Besides this they had about 1000l. worth of copper ore on the floors, which was not included in the present accounts, and seeing what their prospects were, he thought they could well afford to forego the dividend on the present occasion, and to carry forward the balance to the credit of the next account.—The PURSER pointed out that under any circumstances they could only declare a dividend of 10s. per share. This would leave a balance of about 340l., but he thought they would stand far better before the public if they carried the whole amount forward.—It was unanimously decided that this should be done.

Mr. RULE next proposed the cordial thanks of the adventurers to Mr. G. L. Basset for his liberality in reducing the dues from 1-18th to 1-20th. All through the depression Mr. Basset had behaved in the most generous manner, and had shown every desire to help them out of the many difficulties with which they had to contend. He came forward very handsomely at a time when the mine was nearly drowned, and he had no hesitation in saying that but for that gentleman the mine would have been under water at this moment. During a period of 25 years Mr. Basset had been connected with the mine, and he had not the slightest doubt that the past history of the mine would be fully repeated in the future.—Mr. LOAM seconded the resolution, and in doing so said he could not help thinking that the example which Mr. Basset had shown in coming forward to help them in their difficulty would have a very beneficial effect on the county at large, for the lords would one and all see that their interests were closely allied to those of the adventurers.—The resolution was carried amidst applause, and the meeting closed.—*Western Daily Mercury.*

THE CARDIGANSHIRE LEAD MINES.

The formation of the CAMBRIAN MINING COMPANY, whose prospectus will be found in another column, affords a fitting opportunity of once more referring to the interesting history connected with the fine old mines—Esgair Hir and Esgair Fraith—which it is proposed to develop, but before doing so it may be well to state that the company has been formed with a capital of 100,000l., in shares of 2l. each, and that the board of direction includes Col. the Hon. T. G. Cholmondeley, and Messrs. Hilton, Grieves, and Keene. The mines have long been regarded as amongst the most extensive and richest ever discovered in Wales, yet the lease, plant, machinery, buildings, and other appliances and appurtenances have been acquired for 70,000l. in shares. The mines, moreover, are actually in operation, and extend for upwards of three miles on the course of the lode, so that there is an ample field for extension, whilst the fact of the barrack accommodation being sufficient for more than 300 miners should suffice to remove all difficulties in connection with securing an abundance of labour. There is plenty of modern and powerful pumping, drawing, crushing, and dressing machinery, and all requisite storehouses, engine-houses, and offices, and as the chief management of the property has been placed in the hands of Capt. Thomas Glanville, who has had great experience in many successful Cornish mines, it may be anticipated that these appliances will be utilised to the utmost. The promoters of the company say little in recommendation of the mines, preferring to let the reports of the mine inspectors who have examined them speak for themselves.

With reference to the Esgair-Fraith property, Mr. Josiah H. Hitchens describes the mine as an unusually extensive one, and although hitherto copper only has been produced, he considers that it is certain to equal as a lead mine the celebrated Esgair Hir, on the eastern portion of which the lode was also a copper-producing one. With reference both to Esgair Hir and Esgair-Fraith the opinion of Capt. Abesalom Francis is highly favourable. He remarks that there can be little doubt that these mines were amongst the first worked in this country, and that they were worked by the ancient Britons at a very remote period we seem to have ample proof, not only in the old relics found in the most ancient mines, but we may also form a pretty correct surmise as to the purposes the metal extracted was applied. The annals of the original discovery, and the development of the work upon the metallic veins of Cardiganshire, are lost in obscurity. There can be no question (or, least, there is none on my mind) that the oldest excavations and workings were made on copper lodes, or, more properly speaking, where the ore of this metal may be said to have cropped out at surface; and it is somewhat remarkable that in this country this has been the case in three of the richest mines ever yet discovered in it, and have yielded metallic ores to the value of from six to seven millions sterling. As the three mines alluded to are the Copper Hill, at Old Cwmystwith, the eastern portion of the Great Darren, and Esgair-Fraith Mines, the latter being the eastern portion of the very extensive grant of which I am now treating. By far the richest copper ore has been found in this set, and, moving on from the time of the ancient to the modern Britons, it may not be amiss to state here that the last parcel of this ore sold realised 25l. 10s. per ton, or equally as rich in produce as the Cape ore. The tools found in these mines, of which a large quantity have been seen, have been very well worked; and principally on the backs of the lodes here mentioned are stones of great size, and in length from 18 in. to 2 ft. in length, and in breadth from 2 in. to 3 in., marked round the centre, evidently caused by ligature, for holding them tightly with a willow, or some other bandage.

There can be little doubt, on examining the oldest of the levels driven and the workings generally in this country, the former being extremely small (and seems to us surprising how they could have worked them all), that these hammer were used for the purpose of beating copper wedges or chisels (no doubt obtained and extracted from the ore of that metal); but it is equally evident, and I may say impossible, that any very large quantities of metallic ore could have been detached from the lodes at the date I am treating of.—In fact, the workings only extended a small distance in length and a few feet deep on the richest portion of the lodes seen at surface, and it seems that the wants of these early members of the human family were easily supplied, and were confined to arrowheads and for weapons of offence and defence. There can be little doubt, therefore, that this sort of mining are the vestiges of a very remote period, as before stated, as when we enter upon authentic history at the invasion of the Romans, from the introduction of chariots into the British army, it must be argued, as it required no mean skill to construct such vehicles and the tracings connected with them, that mining had considerably advanced in these islands, and that much of the primitive barbarism of ancient Britain had been shaken off. Long before the time of the Romans invading this country the mines of these islands must have been extensively worked. Of this we have the evidence of Cicero, of the disappointment of the Romans at not finding silver mines to answer their expectations in that respect, for it is more than probable, as the Romans were with mining, and finding the silver and lead veins coming down to the margin of the sea on the coast of Cardiganshire, that they were sufficient geologists to pronounce at once that the rocky hills or cliffs of Dover were not likely to encase veins of the precious metals.

That the fame of the silver mines of Britain had spread far and wide amongst the Romans there can be no doubt, for Cicero, almost immediately after his disembarkment of Caesar's troops, writes to his friends thus:—"Of one thing we are already certain, that there is not a grain weight of silver on that island, nor the least prospect of plunder, but from the slaves that may be brought away." The embarkation having been made opposite the coast containing the silver mines we can account for this hasty determination on the ground that the gallant defence made by the brave islanders put the Romans something out of humour with the country generally, and that they had no great appetite to hunt up silver mines after such an unwelcome reception. From the time of the Romans, and for many centuries after, the principal mines in this part of Britain, and foremost amongst them the Esgair-Hir and Esgair-Fraith, although not worked systematically, were very seldom, if ever, left entirely unworked, for as very little of the land for many centuries after the Roman invasion was brought under cultivation, especially on the mountain hill tops, the population would naturally have an immense quantity of spare time at their command, and this, there can be no doubt whatever, was in a great measure devoted to the prosecution and working of the richest of the veins,

by which they were enabled to meet the demands or claims made on them for the occupation of the land. From the nature of the veins—making them as it were near the surface throughout this country, and in no instance could this have been the case more than at Esgair-Hir, for in places the lode has been worked to a width of from 60 to 90 ft. to the grass sods, and as the ore has been worked away for ribs of from 6 ft. down to 3 in.—I believe I am safe in saying that this country has yielded a greater quantity of ore than any other mine in the Principality, and from what I shall have to describe hereafter I think there will not be many dissentients of my taking this view of the case.

Undoubtedly as time wore on fresh discoveries were made and fresh veins opened out, and mining became better known and appreciated, and Cardiganshire came a great mining county, producing annually very large quantities of lead and silver; for I have treated of 114 mines have been worked to some extent in it, and there may be some that have not yet come under my notice, although I think there cannot be many, as 37 years has given me a fair time and opportunity for their minute inspection, as well as having had much to do in planning and marking the lines of the greatest lodes traversing this country, and would be both unnecessary and impossible for me to give the exact details of the working of these mines from century to century, but that they were extensively worked in the time of Charles I. there can be no reason to doubt, for we have and have it as a fact, that the now Gogerddan Estate, which would include the mines—and there can be little doubt these would form the principal of the mines worked by a Mr. Bushel, who amassed a princely fortune by the sale of the importance of the mines of this country were at this time sufficient to obtain a charter to coin at Aberystwith, and a Mint was established there. Several years of these coins are still to be seen at the University of Wales in that town. It would appear to me from Mr. Bushel's time there would seem to be a list in the prosecution of most of the Cardiganshire mines at least seems to me to be a list in the time of Waller, in the 17th century. At this time Esgair-Hir and Esgair-Fraith were by far the richest mines worked in the Principality, and Esgair-Fraith wealth attracted the notice of the Crown, and the ore, being exceedingly rich in silver, was claimed as belonging by right to the King. This action Esgair-Hir, as it is said Sir Carbery Price, ancestor of the Gogerddan House, and who held the mine, as well as being the owner of the land, brought the news from London to the mine in less than 24 hours, rather an uncommon feat to have been performed in those days.

Mr. Waller reported these mines that they were capable of returning an enormous sum of 70,000l. per year profit, and Sir Carbery Price was offered a large sum of money for his shares in the mine. The statements made by Waller have been doubted by many persons, but that his estimates are made with some judgment there can be no doubt, and the more we see of the mine in this district the more probable Mr. Waller's statements and reports become, and if we reflect on this subject and take another property that has been open since during the last few years on about the same line of lodes to the east of these, I think we shall have abundant proof that Waller's statements were perfectly correct. To prove this we will compare the Esgair-Hir lode with the Van lode. The size of the Van varies from 40 to 60 ft. wide, and that of Esgair-Hir is rather wider than the Van. The length of the ore found at Esgair-Hir is immense, indeed wider than the rich copper deposit at Esgair-Fraith, whilst from the richness of the lode the ore taken away from Esgair-Hir since I have resided in the county, and taking fathom for fathom, either cubically or linearly, I believe the Van would bear a comparison to Esgair-Hir. The ore in the lode is almost invariably found nearly solid. From the time of Waller I shall now resume my remarks by coming down to the time of its being worked, when my late brother Matthew Francis, and shortly after when I came into this country. These mines were then in the hands of a Flintshire company, who worked them for many years, greatly improving the lead to the mines, erected some machinery, and brought and kept the ore from the mines from one bunch of ore ground up to from 70 to 100 tons per month. The mines have since changed hands on two or three occasions, each party having discovered rich courses of ore in different parts of the mine, and making returns of from 60 to 100 tons per month from very short bunches of ore.

I must now go shortly into what I would recommend doing to put the mine into a state of proper working, and permanent profits such as was achieved by Waller (70,000l. per annum), and I may first remark that there is an excellent lot of machinery of all kinds on the mines to carry out what I shall recommend to be done, comprising an excellent and powerful steam-engine, two crushers, dressing machine, and dressing apparatus, the latter on the most improved principle, and an abundant supply of water at Esgair-Fraith for working the mine. It is not necessary for me to go into details of the machinery on the mine, or to give a list of them. Suffice it to say that they could not be erected, together with the buildings on these mines, barracks for miners, office, &c., under a sum of 12,000l., but they are invaluable, as, if they had to be erected, it would cost a loss of many years in the profitable working and the development of these mines. In addition to this, it is right to state that there is completed also what would take two years to carry on. This work can be done at once available for working the courses of ore under the present bottom, 30 fathoms. The Blue shaft having been sunk to a depth of 15 fathoms under the deepest workings at Esgair-Hir, and in the centre of the great course of ore worked by Waller, and before reaching the main lode you will intersect the north lode, on which many hundreds of tons of rich lead ore was raised over the adit on tribute, and which has now been seen under, so that from these sources alone large returns can be immediately made, and lay open a very large quantity of profitable stopping ground.

The Esgair-Hir shaft (the lead ore gap shaft) has been sunk 30 fathoms below the ore workings, and here you will also be able to open up open vast quantities of rich ore ground by opening from this point also. At Esgair-Fraith, where, I may say without fear of contradiction, there is the finest and richest gossan ever laid open in this country, and from the very rich copper ore I have alluded to has been extracted, I would advise the sinking of the engine-shaft from the 10 to the 20 ft. level, and to press on these levels under the rich ore ground passed over in the adit and 10 ft. level. You will be sinking your engine-shaft on the course of the lode, and will be getting rich copper ore from it at once. The adit level east should also be kept constantly going. As, as the 20 ft. level has been reached it will lay open very profitable ground, and will lead to a position to make regular returns and sales of both lead and copper mores. I cannot speak too highly of this portion of the property, being fully convinced it will prove enormously rich.

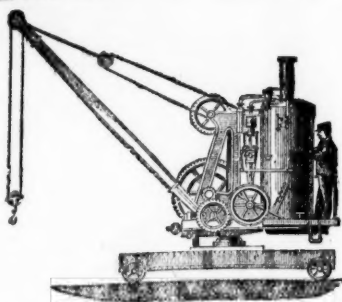
To the west, and near to the western boundary an adit level should be started and kept constantly going by as many men as can conveniently be put to work the same, so as to be driven into the great body of ore at the Esgair-Hir workings. This adit would be continued on the north, and as standing almost all the way throughout the entire distance of the mines, three miles on the eastern of the lodes. The adit would be started at a very short distance from where the old joining mine to the westward they are raising and dressing lead ore at 30 ft. ton. You will not expect me here to go into the details of a thorough working report. I have in this merely gone into matters generally, and I feel confident that you cannot fail to open out these mines equally as profitable as they have been, and that they will not be surpassed by any in this or the coast of joining.

With such opinions as these from men so intimately acquainted with mining generally, and with the district in particular, nothing more should be required to give shareholders the utmost confidence in the property the Cambrian Mining Company proposes to work.

THE LAND OF MIDIAN.—With reference to the recent discoveries of Capt. Burton, that the Land of Midian, on the shores of the Gulf of Akaba, abounds in gold, silver, tin, and antimony, and that the country seems to be full of mineral wealth, it is interesting to note the fact, as recorded in the Old Testament, of the Midianites having not merely personal ornaments of gold, but tablets of gold and chains for the camels' necks, showing the great abundance of this metal. Among the spoils brought from the Land of Midian (Numbers, xxxi.) were "gold, silver, brass, iron, tin, and lead;" and in another expedition the quantity of gold taken was so great that Gideon made an ephod thereof and set it up in his city (Judges, viii.). The discoveries of Capt. Burton, if they should be verified, will be a remarkable confirmation of the truth of the Holy Record.

FINDING DIFFERENCE OF LEVEL.—A simple and ingenious method of ascertaining the difference of level, which would be useful in certain cases underground where a good straight sight cannot be had, has been invented by Mr. H. N. GROUND, of Saltburn-by-the-Sea. He takes two standards or uprights made of any suitable size and material, each of such standards or uprights having a suitable scale conveniently marked thereon, and respectively furnished with an ordinary glass gauge tube or other suitable vessel, either attached to or embedded or inserted therein. He connects such two tubes together by means of a flexible tube of appropriate length attached to their lower ends in any convenient manner, such flexible tube being preferably made of vulcanised india-rubber, or of vulcanite, gutta percha, or any other suitable material, and into such connecting tube and glass tubes he introduces such a quantity of water or other fluid as will, when the two standards are placed together, fill the flexible tube and reach about half the distance up the glass tubes in the standards. He then places each one of such standards directly over or under two given points, which points, for the sake of illustration he calls A and B, and ascertains the distance which the surface or surfaces of the water or other fluid stands immediately above or below each of these points by means of the scales marked on each of the standards or uprights, as before described. Thus, for instance, say at point A this reads 5 ft., and at point B 1 ft., the difference of level between this point would of course be 4 ft., the surface or surfaces of the water being of necessity absolutely level. Another form of the instrument would be to have short glass tubes, or other suitable vessels, fixed at the ends of a flexible tube to be moved up or down separate standards until the surface of the water becomes visible in each, and then read off in the same way as already described. This form with standards of a fixed convenient length could be advantageously employed, more especially in the particular process of levelling known as contouring, or finding the level lines on an uneven surface. The flexible tube may be made if desired of a convenient known length, or with distances marked thereon, so that in making sections no other measuring chain would be required.

CHAPLINS' PATENT



STEAM CRANES,

15 Cwts. to 20 Tons,

Geared to hoist or lower, and turn entirely round in either direction by steam, separately or simultaneously, as required.

STEAM AND HAND DERRICK AND OVERHEAD TRAVELLING CRANES.

CONTRACTORS' LOCOMOTIVES. STATIONARY ENGINES.

Also GEARING, for Winding, Pumping, Sawing, &c.

PATENTERS AND SOLE MANUFACTURERS:

ALEXANDER CHAPLIN AND CO., CRANSTONHILL ENGINE WORKS. GLASGOW.

LONDON HOUSE:

M'KENDRICK, BALL, AND CO., 63, QUEEN VICTORIA STREET, LONDON, E.C.

THE BIRMINGHAM WAGON COMPANY (LIMITED)

MANUFACTURE RAILWAY CARRIAGES AND WAGONS OF EVERY DESCRIPTION, for HIRE and SALE, by immediate or deferred payments. They have also wagons for hire capable of carrying 6, 8, and 10 tons, part of which are constructed specially for shipping purposes. Wagons in working order maintained by contract. MANUFACTURERS also of IRONWORK, WHEELS, and AXLES.

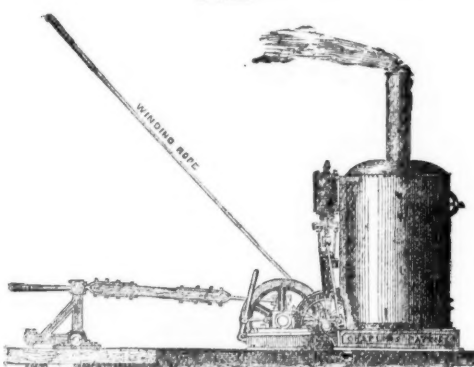
WAGON WORKS, SMETHWICK, BIRMINGHAM.

G. HUTCHINSON AND CO., FORTH BANKS OIL WORKS, NEWCASTLE-ON-TYNE.

Reg to draw the attention of COLLIERY OWNERS and ENGINEERS to the Oils prepared by their special process. They never clog nor corrode, but keep the bearings cool and clean, and will be found the best and most ECONOMICAL LUBRICANTS at present in the market, being very DURABLE, UNIFORM IN QUALITY, and CHEAP. Prices, from 2s.

SPECIAL ADVANTAGEOUS RATES FOR LARGE CONSUMERS. References to many eminent firms who have used them constantly for years, amongst whom may be mentioned Sir W. Armstrong and Co.; Elswick Engine and Ordnance Works, Newcastle; R. Stephenson and Co., Engineers, Newcastle; R. and W. Hawthorn, Engineers, Newcastle; Hawkes, Crawshaw, and Sons, Engineers, Gateshead-on-Tyne; Abbott and Co., Engineers, Gateshead-on-Tyne. Samples, prices, &c., on application. AGENTS WANTED.

Prize Medal—International Exhibition, 1862.



CHAPLIN'S PATENT PORTABLE STEAM ENGINE

FOR PUMPING AND WINDING.

SPECIALY ADAPTED FOR PITS, QUARRIES, &c. SIMPLE and STRONG; require NO FOUNDATION or CHIMNEY STALK, and are EASILY ERECTED or REMOVED.

Sizes, from 2 to 30-horse power.

Steam Cranes, 1½ to 30 tons, for railways, wharves, &c.; hoist, lower, and turn round in either direction by steam.

Stationary Engines, 1 to 30-horse power, with or without gearing.

Hoisting Engines, 2 to 30-horse power, with or without gear.

Contractors' Locomotives, 6 to 27-horse power.

Traction Engines, 6 to 27-horse power.

Ships' Engines, for winding, cooking, and distilling, passed by H.M. Government for half water.

Steam Winches, Engines and Boilers for light screw and paddle steamers.

WIMSHURST, HOLLOCK, & CO., ENGINEERS.

CITY OFFICES: 34, WALBROOK, LONDON, E.C.

WORKS: REGENT'S CANAL DOCK, 602, COMMERCIAL ROAD EAST, LONDON, E. [near Stepney Station.]

ACCIDENTS BY FLOOD AND FIELD. ACCIDENTS OF ALL KINDS.

May be provided against by a Policy of the

RAILWAY PASSENGERS' ASSURANCE COMPANY.

THE OLDEST AND LARGEST ACCIDENTAL ASSURANCE COMPANY.

Hon. A. KINNAIRD, M.P., Chairman.

Subscribed capital, £1,000,000. Annual income, £205,000.

£1,120,000 have been paid as compensation.

A fixed sum in case of death by accident, and a weekly allowance in the event of injury, may be secured at moderate premiums.

Bonus allowed to insureds of five years' standing.

Apply to the Clerks at the Railway Stations, the Local Agents, or—

64, CORNHILL, LONDON.

WILLIAM J. VIAN, Secretary.

MAPS OF THE MINES, AND OF UTAH TERRITORY.

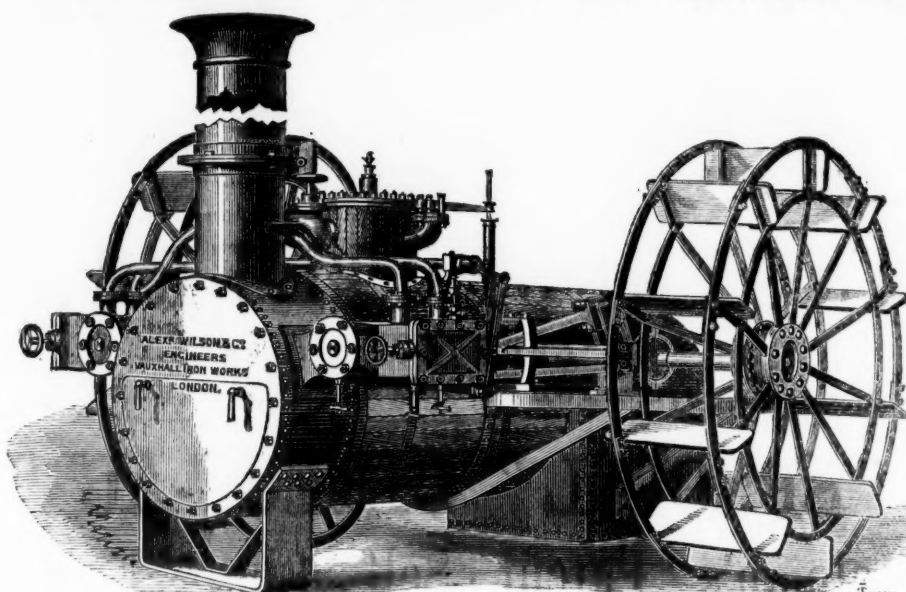
FROISETH'S NEW AND REVISED MAP FOR 1875.—Size 40 by 56 inches, scale 8 miles to the inch. Handsomely engraved, coloured in counties, showing the Towns, Settlements, Rivers, Lakes, Railroads, Mining Districts, &c., throughout the Territory, and all the Government Surveys to date. Mounted on cloth. £2; half-mounted, £1 12s.; pocket form, £1.

Also, GENERAL MINING MAP OF UTAH, showing twenty-eight of the principal Mining Districts adjacent to Salt Lake City, and location of the most prominent mines. Price, pocket form, 6s.

Also, NEW MAP OF LITTLE AND BIG COTTONWOOD MINING DISTRICTS, showing the location of over Four Hundred Mines and Tunnel Sites, together with the Mines Surveyed for United States Patent. Price, sheets, 6s.; pocket form, 8s.

For sale, and supplied by—TRUBNER and Co., 57 and 59, Ludgate Hill, London; or B. A. M. FROISETH, Salt Lake City, Utah, U.S.

ECONOMIC SHIPMENT OF MINERALS.



ECONOMIC SHIPMENT OF MINERALS.

There are almost innumerable instances in which mines capable of producing good marketable ore in ample quantities are either neglected altogether or worked at a loss, owing to the difficulty and expense of getting the mineral to the coast; yet the mines may be in the immediate vicinity of rivers which would be readily navigable with craft not drawing more than a couple of feet of water. To meet these cases a very compact and substantial little paddle engine has been designed by Messrs. ALEXANDER WILSON and Co., of the Vauxhall Ironworks, London, for use in very light draught river steamers, or in such native-built boats as could be built in the most primitive countries. The value of such engines where water carriage can be substituted for land transport where roads are bad or not in existence will readily be understood. In tropical countries shallow rivers abound, but the great cost of adapting ordinary engines to native-built boats has prevented those rivers being utilised, and it has been equally impracticable to send large boats from this country on a ship's deck, or to navigate such light river boats across the ocean. In illustration of the practical utility of the principle it may be stated that a boat is at present plying from Colombo to Negombo, in Ceylon; which, although 60 ft. long and 9 ft. beam, has a draught of only 18 in. forward and 20 in. aft, increased with the load of 75 passengers on board to 21 in. forward and 24 in. aft. The boat itself is of composite construction, the frames being of angle iron sent out to the required shapes ready bent from Messrs. Wilson and Co.'s works, and the planking was done in the island by native workmen. As the engine is complete in itself it has simply to be dropped into its place as it is unshipped.

It is an acknowledged principle that light-draught steamers should be built as lightly as possible in order to attain their object, and it is, therefore, important that the hull should be relieved as much as possible from the strain of the engines and that the centre of gravity of the machinery shall as nearly as possible coincide with the centre of displacement, so that the boat may float on an even keel, while the paddle-wheels must at the same time be somewhere near the middle of the boat's length to facilitate it moving in either direction, and which condition it would be impossible to fulfil without the aid of ballast, if the boiler was placed either forward or aft of the engines. In Messrs. Wilson and Co.'s both these considerations have been admirably fulfilled, so that the engine may not inaptly be described as a "river locomotive," as it is so completely self-contained that it might almost be lifted in one piece with steam up, placed in a boat prepared to receive it, and at once proceed on a trip. The boiler is of the locomotive type, and, although they are of smaller size when adapted to burn coal, are for use in unsettled countries made with an enlarged fire-grate and heating surface, in order to burn wood or cocoa-nut husks; they are also constructed of the cylindrical tubular type. The cylinders are fitted one on each side of the boiler at one end, or in the last design to the support under the smoke box, and the engines inclined, thus lowering the centre of gravity slightly. As the centre of paddle-wheels would be too high if the shaft were carried over the top of the boiler, and too low if carried underneath, it is passed through the barrel of the boiler, either by a cross tube or a pocket let into the top. The framing which carries the crank shaft and paddle bearings consists of angle irons bolted to fastenings rivetted to the boiler, and arranged in such a manner that they are completely independent of the hull, to which they are only slightly secured, though that is not absolutely necessary.

The engines are fitted with the usual link motion reversing gear, the lever for working which is placed conveniently near the smoke-hole. The boiler is fitted with two small auxiliary pumps fixed to it, or with one pump and an injector if preferred. The engine fitted to the boat already mentioned has cylinders 7½ in. diameter and 18 in. stroke. It is fitted with expansion valves, but these they do not recommend, as where economy of fuel is desired they prefer to make one of the cylinders low pressure (compound) with or without a condenser. In salt water a surface condenser should always be used. Compound condensing engines save about 40 per cent. of the fuel, but they are somewhat heavier, cost from 30 to 50 per cent. more, and require more skilled attendance than a simple high-pressure engine. Messrs. Wilson and Co. can also fit these engines with a clip wheel, so that when short rapids are encountered they can slowly wind the boat up by means of a rope. That there are many mining companies at present carrying on operations in distant countries to which such boats as these would be a great boon, and as the first cost of the engines would be by no means large, it may fairly be estimated that in any mine yielding a reasonable quantity of mineral the outlay would speedily be repaid by the economy effected.

NEW ALLOY.—A very beautiful new alloy, intended to replace brass in various ornamental uses, especially in window and door furniture, has been invented by Mr. W. A. HOPKINS, of Paris. The alloy is composed of copper, tin, spelter, or zinc and lead, which metals are manipulated. A crucible is placed in the furnace and fired to red-heat, and into the crucible thus heated the metals are placed in the proportions of—tin 1½ (say) 1 oz., spelter or zinc ½ oz., lead 5-16ths of an ounce. These are the proportions he prefers to use, as he has found them to give excellent and satisfactory results, but he does not intend to confine himself rigidly to the precise proportions named, as they may, perhaps, be slightly varied in some particulars without materially detracting from the beautiful colour of the alloy which it is intended to produce. The molten metals are kept well stirred, and any impurities therein should be removed. When thoroughly mixed this alloy, which is termed the first alloy, is poured off into ingot moulds and left to cool. Copper in the proportion of eight parts to one of this first alloy is then placed in the crucible and brought to melting heat, when the tin or first alloy is added and intimately mixed with the copper, for which purpose the molten mass must be well stirred for several minutes; it is then poured into ingot moulds for sale in the form of ingots, or it may be poured into pattern moulds so as to produce the articles required. This is the mode of manipulation which it

is preferred to employ, as an opportunity is thus afforded of removing any impurities from the first alloy before mixing it with the copper, but all the metals may, if preferred, be mixed together in the proportions given, and melted at one operation. By this means an alloy is obtained of great strength, and of a very beautiful appearance, and which is particularly suitable for small work, such, for instance, as window and door furniture, and other house furniture which is usually made in brass or other alloy of copper, though it is not intended to confine its use to such articles.

MANUFACTURE OF IRON AND STEEL.

Cast-iron containing carbon and other substances, such as manganese, silicon, or other alloy, is now added to fluid iron and steel, by which carbon is added to them. The amount of carbon in cast-iron being limited, a large proportion of cast-iron must be added, if much addition of carbon be required, whereby other substances contained in the cast-iron are necessarily added. The improvement in this respect proposed by Mr. J. G. WILLIAMS, of Westbourne Park, is to carbonise cast-iron or steel granules or particles by mixing them up with a hydro-carbonaceous substance (such as pitch, tar, oil, farnaceous or bituminous substance, and such like), and to heat the mixture to about a red-heat in a retort, vessel, or chamber, without access of air. The metal granules will thus be coated with adhering carbon; he adds these carbonised granules to the fluid iron or steel (sometimes by means of blast or other gaseous current). The quantity of carbon absorbed into the fluid iron or steel will thus be greater than if the original cast-iron alone was added. If it be desired to add or apply deoxidised iron ore or other metals or substances to the fluid iron or steel he applies the material or substance containing it coated with carbon as he does granulated iron.

Cast-irons containing much silicon or phosphorus are at present unsuitable for the production of superior wrought-iron and castings. The same pig-iron if properly refined in the ordinary coke refinery or by other means, will lose the greater portion of its silicon, and if similar or other pig-iron be converted into wrought-iron by the usual process the greater portion of its phosphorus as well as silicon will be removed. Mr. Williams proposes to melt down in a cupola furnace a mixture of refined cast-iron and of wrought-iron. The amount of silicon and phosphorus in the resulting metal may thus be proportioned to equal the average of these substances in cold blast all mine pig-irons, and owing to the contact of the wrought-iron with the coke or other fuel the metal will contain sufficient carbon to fit it for use in the foundry or puddling furnace.

Hitherto the reduction of iron ores or oxides to a metallic condition without melting them has been effected by mixing carbonaceous matter therewith, and heating them in close vessels, or by having the ore or oxide in a retort heated externally, and into which a reducing gas was admitted. It has also been suggested to heat the interior of the retort or chamber in which the ore is placed by the combustion of part of the gas, leaving the remainder in a highly heated condition, but adulterated with watery vapour or carbonic acid to act upon the ore. Mr. Williams' improvement is to bring a reducing gas, such as carbonic oxide or hydrogen, or compounds of hydrogen and carbon, or their mixtures, up to the necessary temperature at which the iron ore or oxide becomes acted upon before it be admitted into contact with them without any such admixture of air as would support combustion, so that the vessel containing the ore or oxide be not necessarily heated, either externally by fuel, or internally by the partial combustion of the gas; or he has the ore or oxide sufficiently heated before it be put into the place where the reducing gas at less temperature in an unignited state be admitted. He prefers to pass the gas through a heater (such as is now used for heating the blast-furnaces will answer), so that it be heated sufficiently to deprive the iron ore or oxide with which it be afterwards brought into contact of the entire or greater part of its oxygen.

In order to facilitate the more uniform action of reducing gas on iron ore or oxide he employs a rotating (preferably inclined) cylinder or vessel, into which ore or oxide is placed; he has a gas pipe with sufficient opening for the exit of the gas inserted into the cylinder, and around which the cylinder and its contents (however heated) revolve. The position of the ore particles are thus continually changed, and the gas brought more equally amongst them. When the ore or oxide be sufficiently deprived of its oxygen it may be transferred from the cylinder into vessels to cool without access of air for after use as iron in a divisional state in the manufacture of iron and steel, or for other purposes; or it may be transferred whilst still hot into chambers or vessels to be welded or melted into malleable iron or steel; he sometimes adds carbon or finely granulated cast-iron to the reduced ore or oxide before welding or melting it.

PERPETUAL MOTION.—Mr. LUDEKE, of St. Benét-place, Gracechurch-street, has re-invented the old ball wheel, so much in favour of the former seekers of perpetual motion. He supposes that the fall of a 1-lb. ball will raise a 6-lb. ball on the other side of a pulley. He has a complicated arrangement of contrivances—gyroscopic pumps, turbines, mercury tubes, and such like, but these only increase the difficulties to be overcome. The essential novelty in the invention consists in the proposal to apply it in clocks and watches. Mr. Ludeke did not proceed to a patent.

HOLLOWAY'S PILLS AND OINTMENT—IRRITABLE BOWELS.—To be able to arrest the progress of bowel complaints must be a very desirable object; nothing will accomplish this so safely and certainly as Holloway's ointment well rubbed twice a day over the abdomen. It has an advantage over every other stringent, since it restrains the purging without interfering with the stomach or liver. On reaching the bowels this unguent soothes their irritated lining, and simultaneously relieves all griping, purging, vomiting, disagreeable eructations, and gives general ease, without danger of checking the diarrhoea too suddenly. In dysentery the same treatment, aided by proper doses of Holloway's pills, will allay the excessive straining, stop the discharge of slimy matter, and painlessly prevent both ulceration and danger.

* * * Now ready, price £1 12s. 6d., neatly bound in cloth and lettered, the FORTY-SIXTH VOLUME of the MINING JOURNAL. To be had from our office, 25, Fleet-street, London, or through and Newsagent or Bookseller.



PARIS INTERNATIONAL EXHIBITION, 1867.



VIENNA INTERNATIONAL EXHIBITION, 1873.



LONDON INTERNATIONAL EXHIBITION, 1874.



CORNWALL POLYTECHNIC SOCIETY, 1867 and 1873.

TANGYE BROTHERS AND HOLMAN,
10, LAURENCE POUNTNEY LANE, LONDON, E.C.,
AND BIRMINGHAM, (TANGYE BROTHERS), CORNWALL WORKS, SOHO.

The "SPECIAL" DIRECT-ACTING STEAM PUMP,
WITH
Holman's Patent Self-acting Exhaust Steam Condensers.

UPWARDS OF 12,000 "SPECIAL" STEAM PUMPS ARE IN USE.

After eight years of successful application for all purposes to which steam-driven pumps can be applied, THE "SPECIAL" STEAM PUMP STILL MAINTAINS THE FIRST POSITION IN THE MARKET, notwithstanding that it alone—of all direct-acting pumps—has been subjected to the great variety of severe tests that must be encountered in such a period of time. Some valuable improvements have been suggested in the course of a long experience, and their adoption has rendered the apparatus at once the simplest and most certain in action. There is absolutely no extraneous gear, and the steam cylinder is no longer than the pump. The valves are of easy access, and are suited for pumping fluids and semi-fluids of almost any consistency.

Holman's Condenser

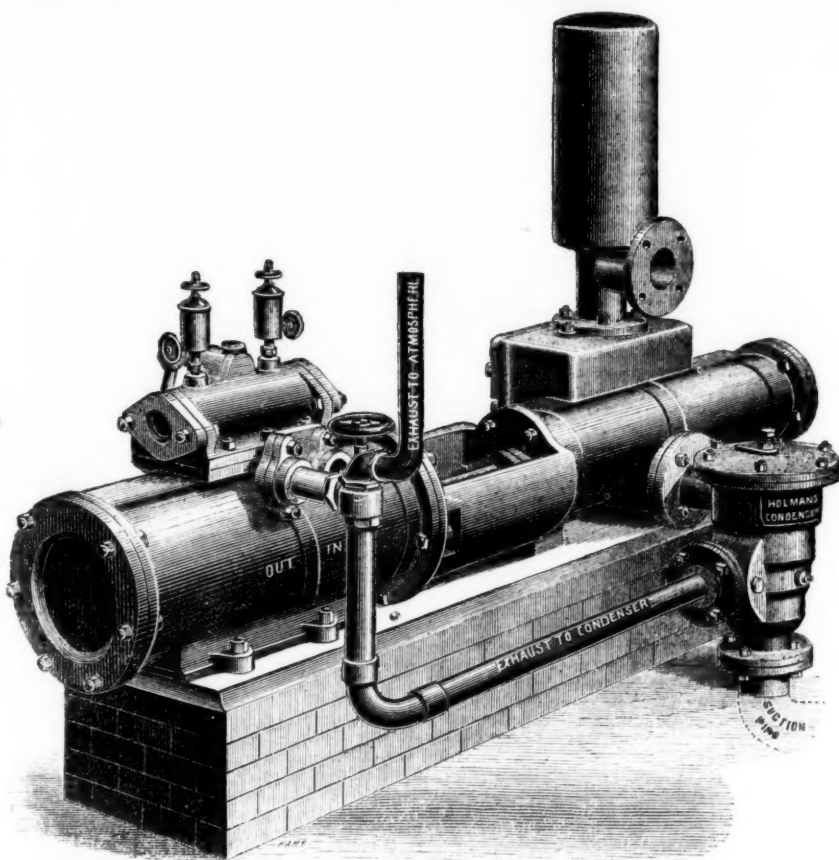
Turns waste steam into
GREAT POWER.

SAVES HALF ITS COST IN PIPES AND CONNECTIONS.

PREVENTS ALL ESCAPE OF STEAM IN MINES OR ELSEWHERE.

REQUIRES NO EXTRA SPACE.

SAVES TWENTY TO FIFTY PER CENT.
OF FUEL.



WILLIAM ELLIOT, Esq., of the Weardale Iron and Coal Company, writes under date Sept. 17th, 1875, as follows:—"We have now THIRTY-FIVE of your SPECIAL STEAM PUMPS in operation at the various collieries under my charge—some of them employed pumping water out of our pits to the depth of 50 fms.—others employed in the pits, and a good many feeding Boilers. I have no hesitation in saying that we have found them the Cheapest and Best Pumps of the kind we have tried. I can with confidence recommend them to intending purchasers."

Messrs. BURT, BOULTON, and HAYWOOD, Chemical Manufacturers, of London, have FORTY of the "SPECIAL" STEAM PUMPS in use at their works.

HOLMAN'S CONDENSERS

Are made to suit any size and kind of Steam Pump. They form a part of the suction pipe of the Pump, and while they effectually condense the exhaust steam they produce an average vacuum of 10 lbs. per square inch on the steam piston, increasing the duty of the Engine, and effecting a saving in fuel of from 20 to 50 per cent.

In Mining operations these Condensers will be of great value.

All Boiler Feeders are recommended to be fitted with these Condensers, as not only is the exhaust steam utilised in heating the feed water, but is returned with it into the boiler.

GREAT REDUCTION IN PRICES.

The following sizes are suitable for low and medium lifts:—

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--------|------|------|------|--------|--------|------|------|-----|-----|-----|
| Diameter of Steam Cylinder ...In. | 3 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 9 | 9 | 10 | 10 | | | |
| Diameter of Water Cylinder ...In. | 1½ | 2 | 3 | 4 | 3 | 4 | 5 | 3 | 4 | 5 | 6 | 3 | 4 | 5 | 6 | 7 | 4 | 5 | 6 | 7 | 8 | 5 | 6 | 7 | 8 | 9 | 5 | 6 | | | |
| Length of StrokeIn. | 9 | 9 | 9 | 9 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 18 | 12 | 12 | 12 | 18 | 24 | 12 | 12 | | | |
| Gallons per hour | 680 | 815 | 1830 | 3250 | 1830 | 3250 | 5070 | 1830 | 3250 | 5070 | 7330 | 1830 | 3250 | 5070 | 7330 | 9750 | 3250 | 5070 | 7330 | 9750 | 13,000 | 5070 | 7330 | 9750 | 13,000 | 16,500 | 5070 | 7330 | | | |
| Price of Special Pump ...£ | 16 | 18 | 20 | 25 | 22 | 10 | 27 | 10 | 32 | 10 | 25 | 30 | 35 | 40 | 30 | 35 | 40 | 45 | 50 | 40 | 45 | 50 | 55 | 65 | 50 | 55 | 60 | 70 | 85 | 55 | 60 |
| Extra, if fitted with Holman's Condenser and Blow-through Valve | £7 | £7 | £9 | £11 | £8 | 10 | £11 | 10s | £12 | 10s | £9 | £12 | £15 | £15 | £10 | £13 | £15 | £16 | £22 | £13 | £16 | £16 | £22 | £22 | £16 | £16 | £23 | £24 | £35 | £17 | £17 |

CONTINUED.

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|------|--------|--------|--------|------|------|--------|--------|--------|--------|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Diameter of Steam Cylinder...In. | 10 | 10 | 10 | 10 | 12 | 12 | 12 | 12 | 12 | 12 | 14 | 14 | 14 | 14 | 14 | 14 | 16 | 16 | 16 | 16 | 16 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| Diameter of Water Cylinder...In. | 7 | 8 | 9 | 10 | 6 | 7 | 8 | 9 | 10 | 12 | 7 | 8 | 9 | 10 | 12 | 14 | 8 | 9 | 10 | 12 | 14 | 9 | 10 | 12 | 14 | 10 | 12 | 14 |
| Length of Stroke.....In. | 12 | 18 | 24 | 24 | 18 | 18 | 18 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 |
| Gallons per hour | 9750 | 13,000 | 16,519 | 20,000 | 7330 | 9750 | 13,000 | 16,519 | 20,000 | 30,000 | 9750 | 13,000 | 16,519 | 20,000 | 30,000 | 40,000 | 13,000 | 16,519 | 20,000 | 30,000 | 40,000 | 16,519 | 20,000 | 30,000 | 40,000 | 20,000 | 30,000 | 40,000 |
| Price of Special Pump...£ | 65 | 75 | 90 | 100 | 75 | 80 | 85 | 110 | 120 | 140 | 110 | 120 | 130 | 140 | 160 | 180 | 140 | 150 | 160 | 180 | 200 | 180 | 190 | 210 | 230 | 210 | 230 | 260 |
| Extra, if fitted with Holman's Condenser and Blow-through Valve | £23 | £24 | £35 | £35 | £20 | £27 | £27 | £38 | £38 | £50 | £28 | £28 | £40 | £40 | £55 | £55 | £28 | £40 | £40 | £55 | £55 | £45 | £45 | £56 | £56 | £56 | £56 | £60 |

Intending purchasers of Steam Pumps would do well to observe the great length of stroke, short steam cylinder, and short piston of the "Special" Steam Pump, as compared with the short stroke, long steam cylinder, and long piston of the Pumps of other makers, as the efficiency and durability of the machine, and the space occupied by same, greatly depend upon this. The advantage of long strokes will be obvious when purchasers are reminded that each set of suction and delivery valves of a "Special" Steam Pump with 24 in. stroke, running at 120 ft. per minute, would open and close only 30 times per minute, as against 120 times per minute in a Pump with only 6 in. stroke performing same duty.

The "Special" Steam Pump can be worked by Compressed Air as well as by Steam.

HUNDREDS of these PUMPS are USED for HIGH LIFTS IN MINES, for which purpose they are made with 21, 24, 26, 28, 30, and 32-inch Steam Cylinders, and 36, 48 and 72-inch Strokes.

The following Testimonial gives one Example of the Power Gained by the action of Holman's Patent Condensers:—

NORLEY COLLIERY, WIGAN.

Messrs. TANGYE BROTHERS AND HOLMAN.

GENTLEMEN,—I have great pleasure in recording my entire satisfaction with the working of the Holman's Patent Steam Pump Condenser which you have supplied to us. The complete condensation of the steam is, apart from its value in the strict economical sense, a most valuable feature in the drainage of underground work.

Ing's. The perfect manner in which this important result is accomplished by your Condenser is extremely creditable to you, and merits the thanks and commendation of the Mining Engineer. When we start the "Special" Steam Pump the Condenser commences working automatically, and maintains a constant vacuum of 10½ lbs. per square inch, even when we run the Pump upwards of 80 strokes (168 feet) per minute. It may perhaps be interesting to you to know that when we were running the Pump at 84 strokes (168 feet) per minute, the steam gauge

indicating a steam pressure of 36 lbs. per square inch, 80 yards from the Pump and the Condenser vacuum gauge on the exhaust pipe indicating a steady vacuum of 2½ inches, I turned the exhaust steam from the Condenser into the atmosphere, when the speed at once fell to 44 strokes per minute. The working economy thus shown is really so great that the cost of the Condenser must be saved in a very short time. (Signed) J. THOMPSON.

NORTH OF ENGLAND HOUSE
SOUTH WALES HOUSE...

TANGYE BROTHERS AND RAKE, ST. NICHOLAS BUILDINGS, NEWCASTLE-ON-TYNE.
TANGYE BROTHERS AND STEEL, Tredegar Place, NEWPORT, Mon.; and Oxford Buildings, SWANSEA.

THE "CHAMPION" ROCK BORER

STANDS UNRIVALLED

For Tunnels, Mines, Quarries, Harbour Works, Cutting Blocks of Granite, &c.

The working parts are made of the toughest steel and phosphor-bronze—steel castings are also used—so as to combine strength with light weight.

AIR-COMPRESSING MACHINERY

Of the simplest and best construction.

Combined Water-pressure Engines and Air-compressors, Giving most excellent results.

ULLATHORNE AND CO., Mechanical and Consulting Engineers, 63, QUEEN VICTORIA STREET, LONDON, E.C.

Archer's New Patent Stone Breakers.

Sole Makers: DUNSTON ENGINE WORKS CO., GATESHEAD-UPON-TYNE, ENGLAND.

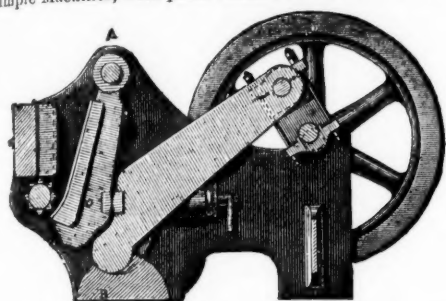
STONE BREAKER,

For Road Metal, &c.

Machines with combined Vertical Jaw and CUBING ROLLER.

Guaranteed to break more cubical and to make less small than any other Machine.

Simple Machines, with plain Vertical Jaws, without Roller.

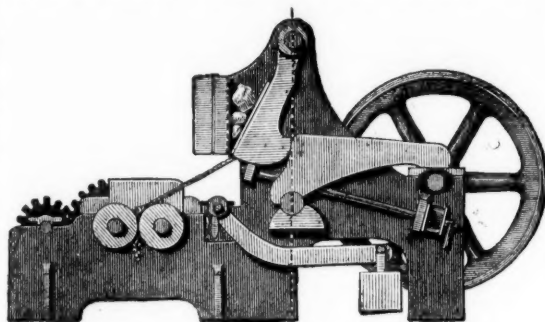


MACHINES can be SEEN at WORK at AGRICULTURAL SHOW to be HELD at BATH, JUNE 4, 5, 6, 7, and 8. SHED No. 3—STAND No. 88.

PULVERISER,

For Crushing and Pulverising Rocks, Ores, Emery Stone, &c., &c.

Apply for prices and particulars to the Manufacturers, as above.



ARCHER'S PATENT BONE MILL—Sole Manufacturers.

MANUFACTURERS OF MARINE AND STATIONARY ENGINES; AND COLLIERY MACHINERY, CAGES, TUB every description of MACHINERY USED IN CHEMICAL WORKS.

THE "CRANSTON" ROCK DRILL

SUITABLE FOR

QUARRYING, SINKING SHAFTS, SUBMARINE BLASTING, TUNNELLING, DRIVING ADITS,

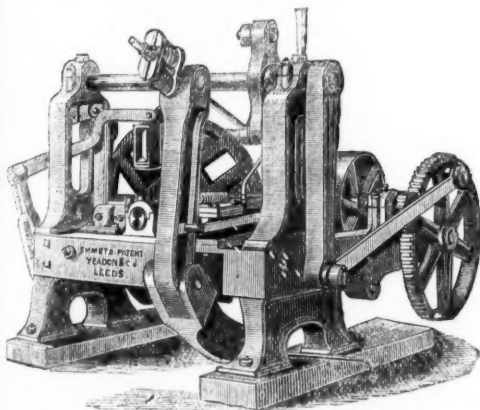
Is the MOST SIMPLE and ECONOMICAL DRILL now in use.

BOILERS; AIR COMPRESSORS, worked by Hydraulic or Steam-power; STEEL for MINING DRILLS; PUMPING, and all other MINING MACHINERY supplied.

For Prices, Estimates, and other Particulars, apply to—

J. G. CRANSTON, 22, GREY STREET, NEWCASTLE-ON-TYNE.

Mr. TAIT, Manager, East Hetton Quarry Company's Works, Coxhoe, Durham, writing on May 12, 1876, says—"I have pleasure in testifying to the value of your Rock Drills. The two you supplied us with about six months ago are giving us entire satisfaction. The cost of drilling by machine is less than ONE-FOURTH THAT OF DRILLING BY HAND. By the use of the Drills we have been able very greatly to increase the out-put of stone without increasing the number of men employed."



EMMET'S A1 PATENT BRICK MACHINE.

Massive; durable; cheap; takes little power, and gives PERFECT SATISFACTION.

This is the ONLY Machine which presses the Brick equally on BOTH sides, each plunger entering the mould plate $\frac{3}{8}$ in., and turning out 12,000 SQUARE, SOLID, PRESSED Bricks per day, READY AT ONCE FOR THE KILN.

SOLE MAKERS—

YEADON AND CO., CROWN POINT FOUNDRY, LEEDS.

Makers of EVERY DESCRIPTION of Colliery and Brick Yard Plant.

LONDON AGENTS—HAUGHTON AND CO., No. 122, CANNON STREET, E.C.

CONTINENTAL AGENTS—FLAMBECK AND DARKIN, 171, QUEEN VICTORIA ST., E.C.

J. WOOD ASTON AND CO., STOURBRIDGE

(WORKS AND OFFICES ADJOINING CRADLEY STATION),

Manufacturers of

CRANE, INCLINE, AND PIT CHAINS,

Also CHAIN CABLES, ANCHORS, and RIGGING CHAINS, IRON and STEEL SHOVELS, SPADES and FORKS, ANVILS, VICES, SCYTHES, HAY and CHAFF KNIVES, PICKS, HAMMERS, NAILS, RAILWAY and MINING TOOLS, FRYING PANS, BOWLS, LADLES, &c., &c.

Cable Winches, Pulley and Snatch Blocks, Screw and Lifting Jacks, Ship Knees, Forgings, and Use Iron of all descriptions, STOURBRIDGE FIRE BRICKS AND CLAY.

BORING AND SINKING.

WILLIAM COULSON AND SON

Are prepared to UNDERTAKE BORINGS for MINERAL EXPLORATION, either from the SURFACE or UNDERGROUND WORKINGS; BORINGS for WATER SUPPLIES or TUNNEL SOUNDINGS, &c., at fixed prices, according to the size of bore-hole required; also to EXAMINE and REPORT upon the BEST MEANS to SECURE DEFECTIVE TUBBING.

Plans and specifications prepared for Shaft Tubbing, Wedging Cries, Pumping, and General Sinking Arrangements.

Address: W. COULSON AND SON, SHAMROCK HOUSE, DURHAM.

PATENT

"INGERSOLL ROCK DRILL,"

LE GROS, MAYNE, LEAVER, & CO.,

60, Queen Victoria Street, London, E.C.

5, PARK PLACE, NEW YORK, U.S.A.



We claim 40 per cent. greater effective drilling power, and offer to compete with any machine of its class.

See following extracts from the reports of Judges in awarding Medals:—

"2. Its simple construction ensures durability, &c.

"4.—The steam or air cushions at each end of cylinder effectually protect from injury.

"5. Its having an automatic feed, giving it a steady motion, &c.

"6. Its greater steadiness and absence of jar and vibration experienced in other drills, which is very destructive to their working parts, &c.

"7. Its greater power is some FORTY PER CENT. in favour of the Ingersoll."

Medals awarded for several years in succession "For the reason that we adjudge it so important in its use and complete in its construction as to supplant every article previously used for accomplishing the same purpose."

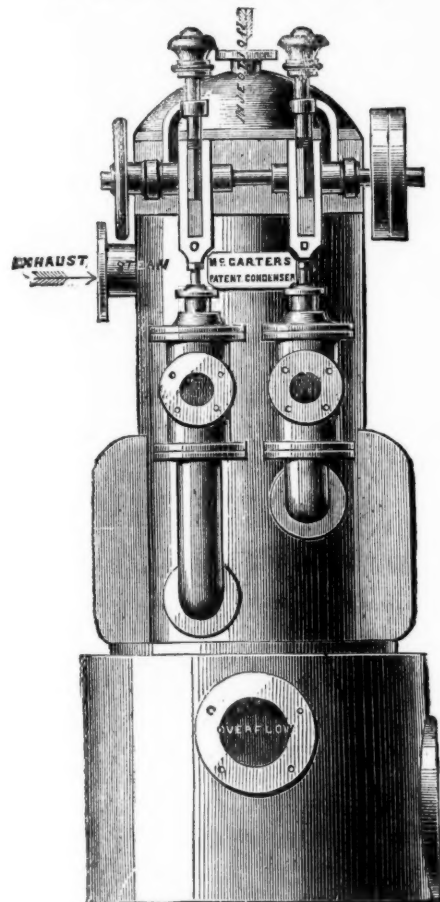
Estimates given for Air Compressors and all kinds of Mining Machinery. Send for Illustrated Catalogues, Price Lists, Testimonials, &c., as above.

LICENSED MAKERS.

KIRK, RAMSDEN, AND CO.

(LIMITED)

HUDDERSFIELD.



These Condensers can be placed inside or outside of the engine-house. They draw their own injection water, and require no foundation. Specially adapted to Pumping and Winding Engines, effecting a saving from 20 to 30 per cent. in coal, and increases the power of the Engine.

Engineers, Millwrights, Founders, AND FORGE PROPRIETORS.

Makers of Pumping, Winding, and Blowing Engines, Condensing and Non-condensing. Horizontal and Beam Engines for all purposes.

LA HOUILLE (Weekly Journal) represents the IRON and COAL TRADES OF FRANCE. Advertisements referring thereto, and subscriptions, 30s. per annum, post paid, received by the London Agents, EDWARD CASPER and Co., 40, Finsbury Circus, E.C.

Just published, Free Edition.

GUIDE TO HEALTH; or, ADVICE AND INSTRUCTIONS FOR THE CURE OF NERVOUS DEBILITY.—A New Medical Work on the Treatment of Local Debility, Consumption, Loss of Memory, Physical Depression, Indigestion, and all diseases resulting from loss of nerve power. Illustrated with cases and testimonials. Sent free for two stamps.—Dr. SMITH will, for the benefit of country patients, on receiving a description of their case, send a confidential letter of advice.

Address: Dr. H. SMITH, 8, Burton-terrace London, W.C.

BLAKE'S NEW PATENT STONE BREAKER.

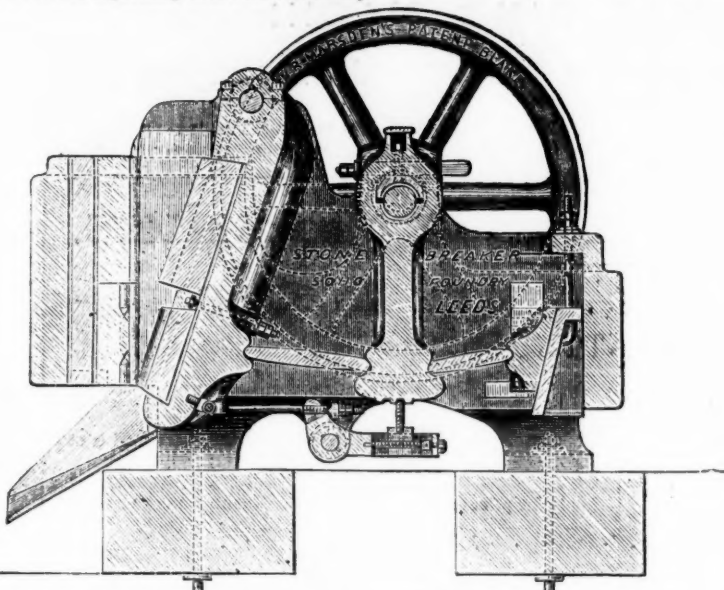
H. R. MARSDEN,

ORIGINAL PATENTEE, AND ONLY MAKER IN THE UNITED KINGDOM.—2000 IN USE.

These Machines are in extensive use amongst the Tin, Copper, Lead, and other Mines, and are showing a clear saving of 4d. and 6d. per ton over the ordinary mode of hand spalling, besides a diminution of stamping power equal to 30 per cent., which is a considerable saving. They are already well known to the mining world, and can be seen in operation at some of the leading Cornish and other Mines. For breaking the elvan rock they have established a decided supremacy over other Machinery.

Exclusively adopted by Her Majesty's Government, and by most Continental Governments.

Machines for Hand and Steam Power, specially designed and largely used for Crushing Pyrites, Limestone, Cement, Coal, Rocks, Ganister, &c., at all the principal works in the Kingdom.



Used by all the Great Mining Companies in the World, and are shown by Testimonials to effect a Saving of FIFTY per cent. over every other system. Awarded 62 Gold and Silver Medals:—

Paris, 1867.
Santiago, 1869.
Leeds, 1875.
Leicester, 1868.
Cardiff, 1872.
Bolton, 1872.
Ayr, 1873-4-5-6, &c.

EXTRACTS FROM TESTIMONIALS.
"They occupy an important position as labour-saving Machines."—*Architect*.
"The Machine is well designed, simple, but substantially made, and is capable of reducing any material to fine gravel, such as copper ore, and is certainly preferable to the stamps in use for that purpose."—*Mining Journal*.
"Your Machine will crush from 60 to 120 tons of hard limestone per day of 10 hours."

This illustration shows my new patent REVERSIBLE Cubing Jaws, which are made in upper and lower sections, and the backs planed, so that when the bottom part of the lower section becomes worn it can be turned upside down, and thus made equal to new. This process does not require the aid of skilled labour, the white metal being entirely dispensed with.
THESE JAWS WILL WEAR FOUR TIMES longer than any other, and they can be renewed at a fractional cost.

"No Machine is equal to yours, combining as it does very great power, simplicity of construction, and cheapness."
"Mr. Marsden's Stone Breakers are so thoroughly well known and appreciated that it is unnecessary for us to describe their construction or speak of their merits."—*Engineering*.
"By the use of your Machine we have reduced the cost of breaking and forming road material to one-half its previous cost."
"Our 15 by 7 Machine has broken 4 tons of hard whinstone in 20 minutes for fine road metal, free from dust."

CATALOGUES, TESTIMONIALS, &c. (in the French or German language, if required), on application to the sole maker of "Blake's" Stone Breaker:—

H. R. MARSDEN, SOHO FOUNDRY, LEEDS, ENGLAND.

The Barrow Rock Drill COMPANY

Are NOW PREPARED to SUPPLY their DRILLS, the ONLY ONES that have been SUCCESSFULLY WORKED in the MINES of CORNWALL. At DOLCOATH MINE, in the HARDEST known ROCK, A SINGLE MACHINE has, since its introduction in July, 1873, driven MORE THAN THREE TIMES the SPEED of HAND LABOUR, and at TWENTY PER CENT. LESS COST PER FATHOM.

In ordinary ends two machines may be worked together, and at a proportionately increased speed. They are strong, light, and simple, easily worked, and adapted for ends and stopes, and the sinking of winzes and shafts.

The company are also prepared to SUPPLY COMPRESSORS, and all necessary appliances for working the said Drills.

Apply to—

LOAM AND SON,
LISKEARD, CORNWALL.



By a special method of preparation, this leather is made solid, perfectly close in texture, and impermeable to water; it has, therefore, all the qualifications essential for pump buckets, and is the most durable material of which they can be made. It may be had of all dealers in leather, and of—

I. AND T. HEPBURN AND SONS,
TANNERS AND CURRIERS, LEATHER MILLBAND AND HOSE PIPE MANUFACTURERS,
LONG LANE, SOUTHWARK, LONDON
Prize Medals, 1851, 1855, 1862, for
MILL BANDS, HOSE, AND LEATHER FOR MACHINERY PURPOSES.

Now ready, price 3s., by post 3s. 3d., Sixth Edition: Twentieth Thousand Copies much improved, and enlarged to nearly 200 pages.

HOPKINSON'S CONVERSATIONS ON MINES, between Father and Son. The additions to the work are near 80 pages of useful information, principally questions and answers, with a view to assist applicants intending to pass an examination as mine managers, together with tables, rules of measurement, and other information on the moving and propelling power of ventilation, a subject which has caused so much controversy.

The following few testimonials, out of hundreds in Mr. Hopkinson's possession, speak to the value of the work:—

"The book cannot fail to be well received by all connected with collieries."—*Mining Journal*.

"Its contents are really valuable to the miners of this country."—*Miners' Conference*.

"Such a work, well understood by miners, would do more to prevent colliery accidents than an army of inspectors."—*Colliery Guardian*.

London: MINING JOURNAL Office, 26, Fleet Street; and to be had of all book-sellers.

THE GREAT ADVERTISING MEDIUM FOR WALES.
THE SOUTH WALES EVENING TELEGRAM
(DAILY), and
SOUTH WALES GAZETTE
(WEEKLY), established 1857.
The largest and most widely circulated papers in Monmouthshire and South Wales.
CHIEF OFFICES—NEWPORT, MON.; and at CARDIFF.

The "Evening Telegram" is published daily, the first edition at Three P.M., the second edition at Five P.M. On Friday, the "Telegram" is combined with the South Wales Weekly Gazette, and advertisements ordered for not less than six consecutive insertions will be inserted at an uniform charge in both papers.
P. O. O. and cheques payable to Henry Russell Evans, 14, Commercial-street, Newport, Monmouthshire.

MINING PROSPECTUSES AND ANNOUNCEMENTS OF PUBLIC COMPANIES should be inserted in the BARNSTABLE TIMES, published every Tuesday, and in the DEVON POST, published every Saturday, as these papers circulate largely throughout Devon and Cornwall, where many thousands of investors reside. Legal and Public Companies' advertisements, 6d. a line each insertion; Trade and Auctions, 4d. a line; Wanted, &c., 2d. words, 1s. Published by J. B. JONES, Barnstaple-street, Barnstaple, Devon, to whom all orders by post or telegraph should be sent.

BRYDON AND DAVIDSON'S ROCK DRILL.

SELECTED BY THE BRITISH AND OTHER GOVERNMENTS.

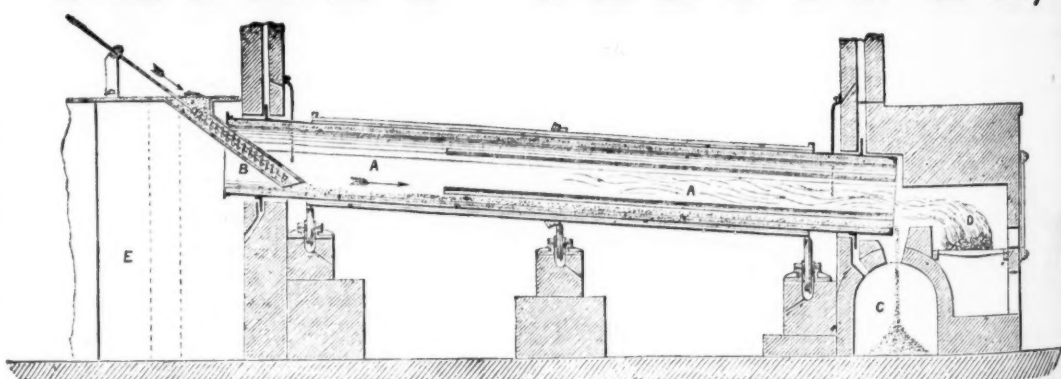
Reduced prices of this Rock Drill (formerly called "Kainotomon"), Nos. 1 and 2, £32 and £34. SUBJECT TO DISCOUNT.

IMPROVED AIR COMPRESSORS.

Makers of Pumping and Winding Engines, Steam Hammers, Boilers, Pump Pipes, &c., &c. Castings of all kinds.

BRYDON AND DAVIDSON, ENGINEERS,
WHITEHAVEN.

OXLAND AND HOCKING'S PATENT CALCINER,



For Roasting Ores containing Sulphur, Arsenic, and other Volatile Matters, have been supplied to some of the principal Mines in the United Kingdom and Abroad.

For particulars, apply to—

Dr. OXLAND, 8, PORTLAND SQUARE, PLYMOUTH; or to
Mr. JOHN HOCKING, Jun., TREWIRGIE TERRACE, REDRUTH.

MANCHESTER WIRE WORK.

NEAR VICTORIA STATION, MANCHESTER.

(ESTABLISHED 1790).

JOHN STANIAR AND CO.,

Manufacturers by STEAM POWER of all kinds of Wire Web, EXTRA TREBLE STRONG for LEAD AND COPPER MINES.

Jigger Bottoms and Cylinder Covers woven ANY WIDTH, in Iron, Steel, Brass, or Copper.

EXTRA STRONG PERFORATED ZINC AND COPPER RIDDLES AND SIEVES.

Shipping Orders Executed with the Greatest Dispatch.